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State University of New York College of Environmental Science and Forestry

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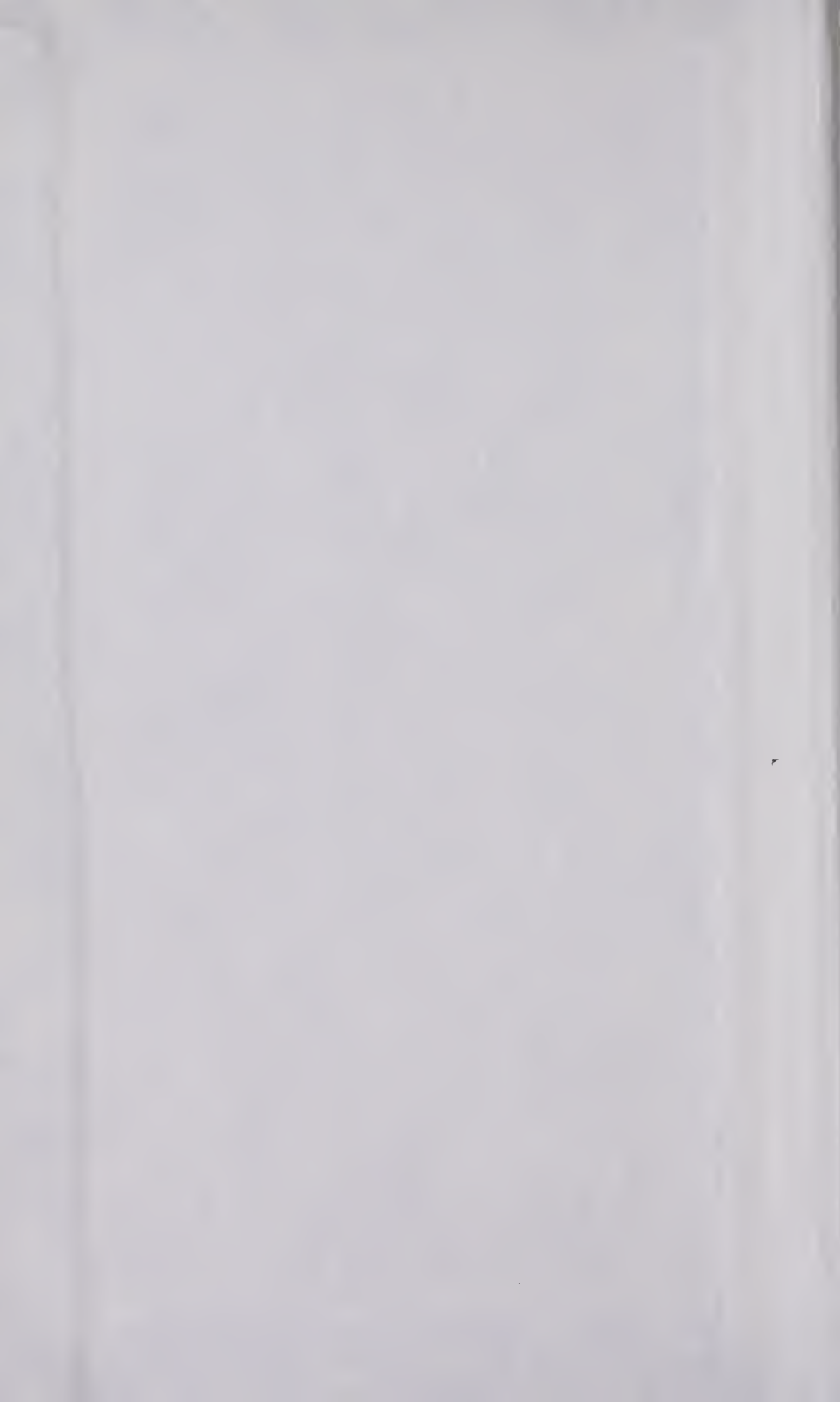
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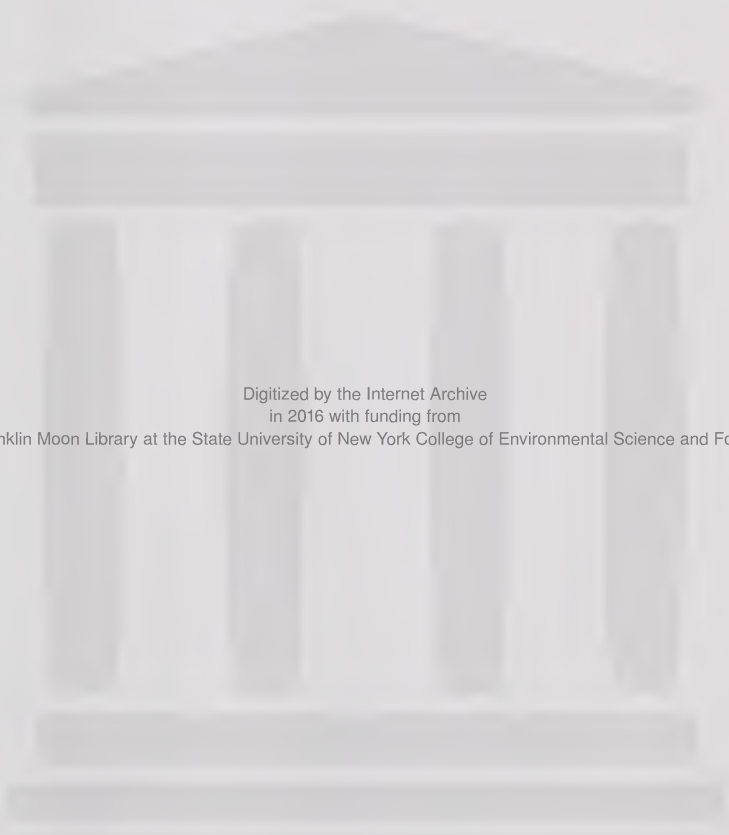
**GRADUATE AND
UNDERGRADUATE**

**STATE UNIVERSITY
OF NEW YORK
COLLEGE OF FORESTRY**

Vol. 7

**1972-73
TO
1973-74**





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1972-1973 GENERAL CATALOG

STATE UNIVERSITY OF NEW YORK COLLEGE OF
ENVIRONMENTAL SCIENCE AND FORESTRY



STATE UNIVERSITY OF NEW YORK

"The State University of New York—with more than 320,000 students on 70 campuses from Suffolk on Long Island to Fredonia in the west—stands proudly as an institution unparalleled in its development, unique in its diversity and increasingly looked to as a model of what the public university of the future must become."

In this manner, Chancellor Ernest L. Boyer, at his inauguration in April, 1971, described the State University of New York—America's largest university system and, at the age of 23, its youngest.

Since its founding in 1948, the State University has grown from 29 State-supported but uncoordinated campuses into an organized system of higher education comprising 72 institutions which enrolled 207,000 full-time and 114,000 part-time students in academic 1970-1971.

Specifically, the University encompasses four university centers (two of which—Buffalo and Stony Brook—include health science centers); two medical centers; 13 colleges of arts and science; a nonresidential college; three specialized colleges; six agricultural and technical colleges; five statutory colleges; and 38 locally-sponsored community colleges. Together, they offer students a choice of more than 3,100 academic specializations, representing more than 1,500 different degree programs. Twelve of the campuses offer graduate study at the doctoral level, 22 at the master's level.

Advanced degree study encompasses a wide spectrum, including agriculture, business administration, criminal justice, dentistry, engineering, forestry, medicine, nursing, optometry, pharmacy and veterinary medicine.

Four-year programs emphasize the liberal arts and science and include such specializations as teacher education, business, forestry, physical education, maritime service, ceramics, and the fine and performing arts.

The two-year colleges offer associate degree opportunities in arts and science and in technical areas such as agriculture, business, civil technology, data processing, police science, nursery education, nursing, medical laboratory technology, and recreation supervision. The two-year colleges provide transfer programs within the University for students wishing to earn a baccalaureate degree.

Responding to the needs of New York State's economically and educationally disadvantaged citizens, the State University has also established six urban centers and six cooperative college centers. The former provide training for skilled and semi-skilled occupations as well as college foundation courses for youths and adults in inner-city areas. The latter combine the resources of public and private colleges within a region in a joint effort to prepare students for full-time college programs.

Diversity at the State University is further emphasized by its innovative approaches to education. Empire State College, the 72nd and newest institution, is a non-residential college whose students earn degrees without being attached to a specific campus or having to enroll in traditional courses. Its coordinating center at Saratoga Springs reaches out to students through regional learning centers which will be opened, eventually, at 20 locations throughout the State. In another approach, Upper Division College, presently located in temporary facilities in Utica, is designed exclusively for junior and senior year students and for those seeking masters' degrees.

Ultimately responsible for the decisions which have led to the growth and diversity of the State University is its Board of Trustees. Appointed by the Governor, the Board determines the policies to be followed by all State-supported institutions of higher education, with the exception of the senior colleges of City University of New York. The Board's policies are administered by the Chancellor, the chief executive officer of the University.

While the 38 community colleges have their own local boards of trustees, and the State pays only one-third of their operating costs and one-half of their capital costs, these two-year colleges operate under the University program.

It is a program which the Trustees and the Chancellor base on a fundamental principle and one which draws the vast and complex campus system into a single University: the improvement and extension of educational opportunities to citizens throughout the State.

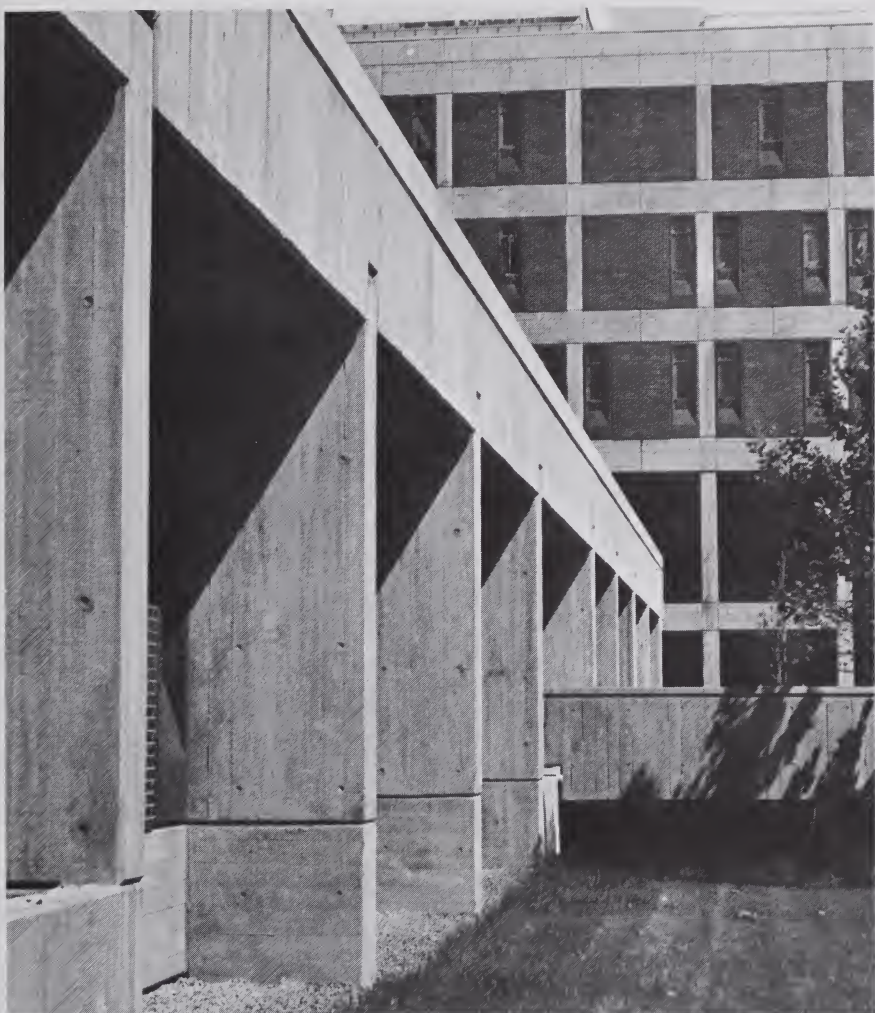
The State University motto asserts that principle: "Let Each Become All He Is Capable of Being."

1972 - 73 GENERAL CATALOG ADDENDUM

The College Faculty and Professional Staff

- IRA H. AMES (1972), *Adjunct Assistant Professor*, Department of Forest Botany; B.A., Brooklyn College, 1959; M.S., New York University, 1962; Ph.D., 1966
- ROBERT E. ANTHONY (1953), *Technical Specialist*, Department of Forest Botany; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1952
- C. ELLISON BECK (1970), *Technical Specialist*, Department of Forest Chemistry
- WILLIAM H. BETTINGER (1972), *Technical Specialist*, Central Research Services
- DONALD H. BICKELHAUPT (1969), *Technical Assistant*, School of Environmental and Resource Management; B.S., State University of New York, College of Environmental Science and Forestry, 1969
- ROBERT R. BOLTON (1972), *Instructor*, Department of Forest Engineering; B.A., LeMoyne College, 1959; M.S., Syracuse University, 1965
- KENNETH F. BURNS (1970), *Technical Assistant*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1969
- LINDA J. CARMAN (1967), *Technical Assistant*, Central Research Services
- JAMES O. CREVELLING (1970), *Technical Assistant*, Southeast Water Supply Study Commission; A.A.S., Paul Smith's College, 1965; B.S., University of Massachusetts, 1967
- ZOLTAN CSUROS (1972), *Technical Assistant*, Polymer Research Center; B.S., Institute of Organic Chemistry, 1964; M.S., 1964; Ph.D., 1970
- ARNOLD C. DAY (1969), *Technical Specialist*, Department of Wood Products Engineering
- JOHN S. FISHLOCK (1965), *Technical Assistant*, Department of Forest Botany; State University of New York College of Environmental Science and Forestry (Ranger School), 1965
- RONALD B. FRODELIUS (1970), *Technical Assistant*, Department of Forest Engineering; B.L.A., State University of New York College of Environmental Science and Forestry, 1963
- MARY L. GREEN (1967), *Technical Assistant*, Central Research Services; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1967
- PAUL R. HUGHES (1946), *Technical Assistant*, Department of Paper Science and Engineering
- DANIEL J. KLEMANN (1970), *Technical Assistant*, Ranger School; State University of New York College of Environmental Science and Forestry (Ranger School), 1966
- LYMAN W. LYON (1970), *Programmer Analyst*, Computer Center; B.A., Syracuse University, 1968

- CHRISTOPHER W. A. MACEY (1972), *Assistant Professor*, School of Landscape Architecture; B.L.A., State University of New York College of Environmental Science and Forestry, 1965; M.L.A., 1971
- ALLEN D. MARSTERS (1966), *Technical Assistant*, Department of Forest Zoology; B.S., State University of New York College of Environmental Science and Forestry, 1966
- RAYMOND D. MASTERS (1968), *Technical Assistant*, Huntington Forest, Newcomb Campus; A.A.S., Paul Smith's College, 1967
- LARRY L. McCANDLESS (1972), *Research Assistant*, Central Research Services
- JOHN J. McKEON (1969), *Technical Specialist*, Department of Wood Products Engineering
- DONALD G. McLEAN (1968), *Programmer Analyst*, Computer Center
- ANDREW McVICKER (1946), *Technical Specialist*, Department of Paper Science and Engineering
- CHARLIE D. MORRIS (1972), *Adjunct Assistant Professor*, Department of Forest Entomology; B.S., Ohio University, 1963; M.S., University of Wisconsin, 1967; Ph.D., 1969
- EDWARD J. MULLIGAN (1968), *Technical Specialist*, Central Research Services
- ROY A. NORTON (1970), *Technical Assistant*, Department of Forest Zoology; B.S., State University of New York College of Environmental Science and Forestry, 1969
- DONALD A. PAFKA (1967), *Technical Assistant*, School of Environmental Resource Management; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1956; State University of New York College of Environmental Science and Forestry (Ranger School), 1966
- JACOBUS B. POOT (1968), *Technical Specialist*, Central Research Services
- FAY RUMSEY (1961), *Technical Assistant*, School of Environmental Resource Management
- ROBERT P. SMITH (1969), *Technical Assistant*, Department of Forest Entomology; B.S., State University of New York College of Environmental Science and Forestry, 1970
- LAWRENCE W. WHELPTON (1969), *Technical Specialist*, Department of Forest Botany; A.A.S., State University of New York Agricultural and Technical College at Alfred, 1965
- DAVID E. WILKINS (1966), *Technical Specialist*, Central Research Services
- PAUL C. ZEMENZ (1969), *Technical Assistant*, Department of Forest Engineering; State University of New York College of Environmental Science and Forestry (Ranger School), 1965



1972-1973

GENERAL CATALOG

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE
AND FORESTRY

STATE UNIVERSITY OF NEW YORK

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COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

BOARD OF TRUSTEES

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Robert V. Jelinek
*Dean of School of Environmental
and Resource Management*
Charles C. Larson
*Dean of School of Landscape
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Bradford G. Sears
*Acting Director of the
Ranger School*
Daniel M. Castagnozzi
*Dean of Public Service,
Continuing Education and
Educational Communications*
John M. Yavorsky

ACADEMIC CALENDARS

SYRACUSE CAMPUS (PROFESSIONAL PROGRAMS AND GRADUATE STUDY)

Fall Semester	1972-73	1973-74 (Tentative)
Dormitories Open	August 27	August 26
Registration	August 28-30	August 27-29
Classes Begin	August 31	August 30
Labor Day (No Classes or Library)	September 4	September 3
Middle of Semester	October 18	October 24
Thanksgiving Recess	November 22-27 (Wednesday, 12:00 Noon-Monday, 8:00 a.m.)	November 21-26
Last Day of Classes	December 9	December 12
Examinations	December 11-19	December 13-21
Christmas Vacation and Intersession	December 20 -January 9	December 22 -January 8

Spring Semester

Registration	January 10-12	January 9-11
Classes Begin	January 13	January 12
Middle of Semester	March 8	March 7
Mid-Semester Recess	March 10-19 (Saturday, 12:00 Noon-Monday, 8:00 a.m.)	March 16-25
Last Day of Classes	April 28	April 27
Examinations	April 30-May 9	April 29-May 8
Commencement	May 12	May 11

Summer Sessions

	1973	1974 (Tentative)
First Session	May 21-June 29	May 20-June 28
Second Session	July 2-August 10	July 1-August 9

WANAKENA CAMPUS (TECHNICIAN PROGRAM)

1972-73

Students Arrive . July 31, August 1
Classes Begin August 2
Recess September 13-17
First Quarter Ends .. November 17
Recess November 18-26
Second Quarter Begins

November 27

Recess December 22-
January 2, 1973

Second Quarter Ends ... March 9

Recess March 10-18

Third Quarter Begins .. March 19

Third Quarter Ends June 15

Graduation June 16, 1973

1973-74

ORIENTATION FOR ALL

FRESHMEN August 20-24

Registration for Sophomores
August 27, 28

Labor Day Holiday .. September 3

Thanksgiving Recess
November 21-25

Final Examinations
December 17-21

INTERSESSION RECESS

December 21-January 20, 1974

Classes Resume January 21

Spring Recess .. March 30-April 7

Final Examinations ... May 27-31

Commencement June 1, 1974

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I

THE COLLEGE GOALS

The forest and related resources of our nation, and of the world, constitute one of our greatest natural legacies. Their future contributions to urban and rural environments as soil and water conservatories, as wildlife habitat, as recreational havens, and as prime sources of raw material for industry depend on wise use and careful planning.

The College's central goal is to enhance mankind's long-term gains from forest and related resources through education, research, and public service. First, it seeks to develop—through broad, general education; and through deep specialization in the physical, engineering, biological, and social sciences; and in design—educated men and women capable of significant contribution to our society. As citizens of broad outlook, and as dedicated professionals combining technical competence, social awareness, discipline, and sense of purpose, they can assure society of the deep understanding and careful planning which underlie capable and efficient use of its forest inheritance. Second, the College seeks to provide through intensive training in field, forest, and laboratory, competent paraprofessionals whose practical knowledge and command of current techniques support and undergird professional programs. Our third goal is to create, through research, new understanding of the social and ecological systems that dominate resource development and use, and new control techniques that can be employed to improve and elevate human life styles and standards. Finally, we seek to encourage, through public education, widespread understanding of the role that forests play in our lives and the enhancement of their contributions through individual and community action.



COLLEGE PROGRAMS AND RESOURCES

The College of Environmental Science and Forestry was founded as a State College in 1911. In its some sixty years of State service, the College has graduated more than 6000 professional students at the Baccalaureate and graduate degree levels and become the largest and one of the leading forestry colleges in the Nation. In addition, more than 3000 forest technicians have been trained in this period at the College's Ranger School. The College program has been characterized by its threefold mission emphasis in instruction, research, and public service as well as the breadth of its program embracing the management, science, design and engineering aspects of forest resources, their products, and environmental issues. In 1948 the College became a unit of the State University of New York when it was created by the Legislature.

In 1972, by special legislative act, the College of Forestry was renamed the State University of New York College of Environmental Science and Forestry to indicate more clearly the traditional grounding and concern of forestry in the environment. The President is the chief executive officer of the College, and is governed by policies established by the College of Environmental Science and Forestry Trustees and the State University Trustees. Because of the cooperative relationship with Syracuse University, a close liaison is maintained with its Chancellor and other administrative officers.

Administratively, the College is organized into five Schools which illustrate the variety of programs available to students. On the Syracuse Campus the Schools are: Biology, Chemistry and Ecology; Environmental and Resource Engineering; Environmental and Resource Management; and Landscape Architecture. The fifth is the Ranger School, located on the Wanakena Campus near Wanakena, New York.

ENVIRONMENT

The campus of the College adjoins that of Syracuse University on one of the hills which surround and overlook metropolitan Syracuse. The city, near the geographical center of New York, is the core of an urban and industrial region of nearly 450,000 population. Numerous manufacturing firms apply modern technology in electrical, chemical, mechanical, metallurgical, and biological fields. Major highways and rail, air, and bus lines, intersect at Syracuse.

Both the City of Syracuse and Syracuse University offer varied cultural and recreational opportunities, including exhibitions of paintings and sculpture, recitals and concerts, amateur and professional theater, dance and cinema, lectures in the humanities, forums and addresses by political and social scientists. The annual Arts Festival is among the special attractions of the campus.

Among the city's cultural assets are the Syracuse Symphony Orchestra and the Everson Museum of Arts of Syracuse and Onondaga County, both with a fine philosophy of community service and participation.

Recreation opportunities are varied because of the central New York climate and geography. General facilities for winter and summer sports are enjoyed by residents and students. The City of Syracuse and Onondaga County have extensive park systems, and State parks are nearby. The Finger Lakes Region begins 18 miles away, and the Thousand Islands are 90 miles from Syracuse. The Adirondack and Catskill Mountain Parks and Niagara Falls are within 150 miles.

CAMPUS SYSTEM

The College has a regional campus system of 6 campuses located at Syracuse, Tully, Wanakena, Cranberry Lake, Newcomb, and Warrensburg. This system is composed of about one-million square feet of facilities and 25,000 acres of land. All of these campuses are used to support the instruction, research, demonstration and public service programs of the College.

The main campus is at Syracuse. It contains about three-fourths of the major academic facilities even though it is the smallest campus, being only 12 acres in size. A 44-acre experiment station is also located in Syracuse and is a few minutes drive from the main campus. On the Syracuse Campus are the following institutes and centers: Cellulose Research Institute, Empire State Paper Research Institute, State University Polymer Research Center, and the Applied Forestry Research Institute. A research center of the U. S. Forest Service is also located at the College.

The Tully Campus is composed of the Heiberg Memorial Forest and a Genetic Field Station. The Wanakena Campus supports the Ranger School Forest Technician Program and has a major instructional and demonstration forest. The Cranberry Lake Campus is the home of the Cranberry Lake Biology Station and one of the two Charles Lathrop Pack Demonstration Forests. The Newcomb Campus contains the Adirondack Ecological Center and the Huntington Wildlife Research Station. The Warrensburg Campus is the site of the second Charles Lathrop Pack Demonstration Forest and is permanent host to the summer session in Field Forestry.

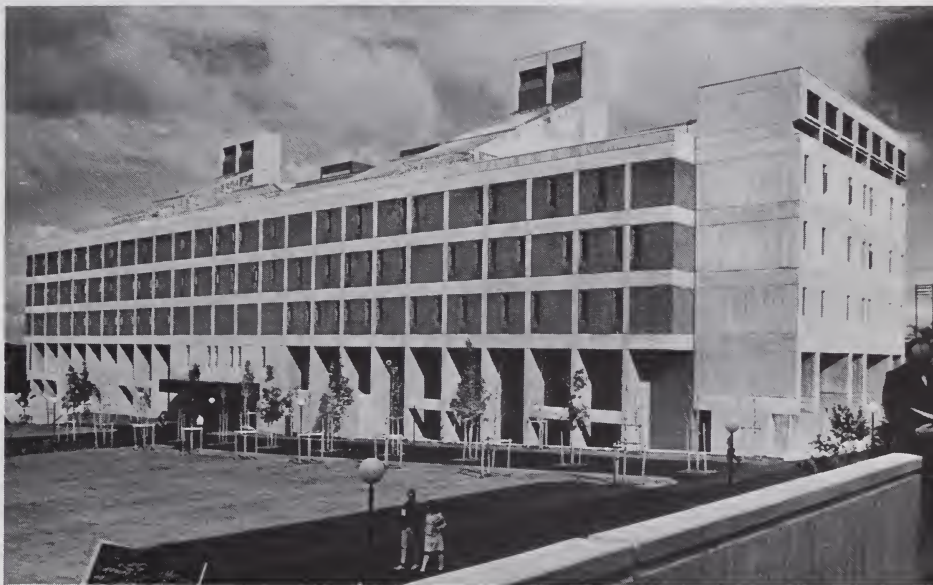
SPECIALIZED FACILITIES

The College is extensively furnished with modern equipment and instruments for instruction and research in its major subject areas. These include electron microscopes, plant growth chambers, air conditioned greenhouses, an animal environmental simulating chamber, a bio-acoustical laboratory, a 1,000-curie cobalt-60 radiation source, radiosotopes laboratories, computer center, and specialized instrumentation including nuclear magnetic resonance, electron spin resonance, mass spectrometer, ultracentrifuge, X-ray and infrared spectrophotometer. Photogrammetric and geodetic facilities of the Forest Engineering Department include one of the most ex-

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Hall*



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Marshall Hall

tensive arrays of equipment in the United States, with a Nistri TA-3 stereocomparator, Mann comparator, computerized Nistri photocartograph, and nine other varieties of plotters. The paper science and engineering laboratory has a semicommercial paper mill with accessory equipment. The Wood Products Engineering Department has a complete strength-of-materials laboratory as well as a pilot scale plywood laboratory and a machining laboratory. The greenhouses and forest insectary are used to produce plant and insect material for classroom and laboratory. Extensive collections are available for study, including wood samples from all over the world, botanical materials, insects, birds, mammals, and fishes.

PROFESSIONAL EDUCATION

At the Baccalaureate level the College provides instruction for professional study in 8 four-year curricula, some of which contain optional programs (see pages 43 to 77 for curriculum descriptions). Each curriculum leads to the Bachelor of Science degree. In the case of one, a fifth year leads to the Bachelor of Landscape Architecture degree. In the Forest Engineering program, a fifth year leading to a Bachelor's in Civil Engineering can be taken at adjacent Syracuse University. A minor in Environmental Studies may be elected in several curricula. Students enter both at the freshman level and as transfers at the sophomore and junior levels in about equal numbers. Scholarships are available for special students.

At the graduate level the College offers programs in 14 major discipline or interdisciplinary areas in forestry, forest products, engineering, landscape architecture and the science disciplines related to natural resources. Gradu-

ate study leading to the Master's degree and Doctor of Philosophy degree began when the College was founded. The first advanced degree was awarded in 1913. Since then, graduate enrollment has increased steadily and now exceeds 300 students per year. More than 1500 advanced degrees have been awarded by the College. The College awards a substantial number of scholarships, fellowships and assistantships annually to graduate degree candidates (see pages 83 to 111 for graduate program descriptions).

A postdoctoral study program is also available with 25-30 participants enrolled at the College each year. This program is closely related to the College's research effort.

TECHNICAL EDUCATION

The College has been training men for technical forestry careers since 1912 at the Ranger School on the Wanakena Campus at Wanakena, N. Y. It is situated on 2691 acres of forested land near Cranberry Lake in the Adirondack Mountains. The Ranger School offers a two-year Associate in Applied Science degree program in practical forestry at the para-professional level, training individuals for positions as state forest rangers; Federal, state, and private industry forest technicians and forestry aides; company district forest supervisors; timber inventory specialists; timber sales supervisors; forest surveyors and engineering aides; forest protection technicians; and other position opportunities.

The program of study is a 1+1 program with one year in general and background studies taken on the Syracuse Campus or at one of the various two-year colleges, followed by two semesters of intensive class and field training on the Wanakena Campus. The second year of the program is practical and intensive, and deals with such activities as forest surveying, timber estimating, mapping, log and pulpwood scaling, tree identification, forest facilities, logging, silviculture, aerial photogrammetry, forest utilization, and wood identification.

Additional information may be obtained from the College Admissions Office.

Ranger School



PUBLIC SERVICE AND CONTINUING EDUCATION

In looking to the future, the College is aware of society's increasing interest and concern with natural resources, the quality of man's environment, the near crisis in water resources, and the need for greater outdoor recreation opportunities. This trend has been called "a growing resource ethic"—an awareness of the obvious and subtle relationships between man and his natural environment, and a desire to enhance them.

The College, accordingly, has recently reorganized its internal structure to provide even greater opportunity for instruction, research, and public service directed towards environmental concepts and issues. Furthermore, a number of changes have been made in the curricula of the four schools within the College, which, in turn, permit greater emphasis on environmental courses as part of the continuing education offerings of the College.

Public service and continuing education activities are functions of the College faculty, individually and collectively. By virtue of this professional richness and depth, the College has the expertise to bridge the biological, physical, and environmental resources management sciences required to meet its broad responsibilities for public information and education in response to the needs of society on a statewide, national, and international basis.

The College's Office of Public Service and Continuing Education coordinates efforts to provide information, advice, and guidance to specialized local, state and Federal agencies, to the forest and wood-using industries, and to the general public on matters relating to the conservation and wise use of forest resources.

Continuing education programs are designed to serve needs in two broad areas: refresher courses to up-date and up-grade professional foresters, technicians and forest industries personnel in the management, production, and multiple use aspects of forestry; and secondly, informational programs which play a vital role in closing the gap between new knowledge and the educational needs of policy planners, civic leaders, school teachers, and the general public.

Public service efforts involve the use of various media and methods. A motion picture film library with supporting production facilities provides films on environmental and forestry subjects. A wide range of College publications, both technical and popular, are available on request, and mass communications techniques, including a speakers' bureau, exhibits, tours, and radio and television programs, are used to reach a broad clientele. Technical advice and guidance are provided to other Federal, state, and local agencies concerned with environmental and resources management and to the wood-using industries of the state in order to improve the products, benefits and services required to meet the ever-increasing demands of society.

Requests for public education services should be sent to: Dean, Public Service, Continuing Education and Educational Communications, State University College of Environmental Science and Forestry, Syracuse, N. Y. 13210.



Baker Laboratory

RESEARCH

Research is one of the three major responsibilities of the College required by its charter, and is an integral part of its total academic effort. The objectives of the College in carrying out a vigorous research program are to provide education in environmental science, forestry and technology; to provide an atmosphere for professional growth, the development of creative thought, and the mastery of investigative techniques; and to create new knowledge which will enable the people of New York, and the nation, to deal more effectively with environmental and natural resource issues.

Toward these objectives and obligations the State University of New York provides a budget for research which is currently about \$845,000 annually. In addition, support in the form of grants and contracts from extramural sources amounts to over \$1,000,000 annually. Federal agencies, private foundations, industry, and other State agencies are among the co-operators. Modern and sophisticated facilities and equipment round out the College's resources for research.

The schools of science, engineering, design, and management provide the framework for a broad program of research at the College. Concentrated efforts are centered in the Empire State Paper Research Institute, Applied Forestry Research Institute, State University Polymer Research Center, and the Adirondack Ecological Center.

The Northeastern Forest Experiment Station of the U. S. Forest Service has centered its recreation research for the region at the College. Forest Service personnel are assigned to the Cooperative Forest Recreation Research



Moon Library

Unit located on campus where they work directly with faculty and students on recreation research and graduate study.

Its location in the midst of the great northeastern megalopolis enables the College to concentrate its energies on the people-resource relations. In addition, the College's strong base in the physical and biological sciences, engineering, and design enhance its leadership in research in urban forestry, land use, remote sensing, recreation, pollution abatement, water, and timber production.

STUDENTS AND FACULTY

Education in the classroom, laboratory, and field is a cooperative endeavor between students and faculty, and is an enriching experience for both. This two-way communication is traditional at the College, so much so that Deans and Department Chairmen, with considerable administrative responsibilities, still meet classes and consider it a privilege to do so.

Men and women are accepted as students at the College, and in the Fall, 1971, numbered 1701. Of these 1366 are undergraduates and 335 are graduate students. In addition there are 13 post doctorates. A growing number of students at the College transfer here from community colleges and other institutions. Transfers can be effected in August as well as January (except Ranger school). International students, both undergraduate and graduate, are encouraged to apply for admission. For detailed information on procedures, refer to How To Apply For Admission, on page 38, and Graduate Study, on page 83.

The teaching and research staff of the College is comprised of 162 faculty. Selected professors are designed as graduate faculty, but they also teach undergraduate courses and are available for undergraduate consulta-

tions. Many of them serve as advisors to undergraduates which is particularly helpful to students seeking advanced degrees.

LIBRARY

The F. Franklin Moon Library contains more than 60,000 cataloged items. More than 775 journals and corresponding indexes are currently received. The collections constitute an information center for forestry and environmental science programs in ecology, botany and pathology, biochemistry, chemical ecology, forest chemistry, polymer chemistry, economics, entomology, environmental studies, industrial pollution abatement, landscape architecture, environmental design, management, paper science and engineering, photogrammetry, silviculture, soil science, water resources, world forestry, wildlife biology, wood products engineering, and zoology. These are supplemented by large collections in the environmental resource field. Additional strength is found in the comprehensiveness of abstract and indexing services relevant to the College's programs. The Library also offers a selected and broad choice of general interest reading material.

The collections of Syracuse University Libraries and S.U.N.Y. Upstate Medical Center are within walking distance. They may be used by all members of the College of Environmental Science and Forestry. Arrangements can often be made to use industrial libraries in the Syracuse area. Other collections are accessible through the Interlibrary Loan privilege.

The library building, opened in 1968, can accommodate 132,000 volumes and seat 575 persons. The main reading areas are in the center of the upper level surrounding open stacks, a Current Periodicals Room, Bibliographic Center, individual study carrels and library staff offices. The Reserve Book Room, Archives, Special Collections, Conference Rooms, and Auto-tutorial Center are located on the lower level.

The recently opened Auto-tutorial Center provides facilities for study with nonbook materials. Slides and phonotapes prepared as integral units of particular courses are held on reserve for use in the Center. Materials are available for review on weekends, evenings, and times when other facilities are closed.

There are two unique collections within the Library. The Robin Hood and Raymond F. Crossman collections contain works on national and world social problems, humanities, education, and popular books concerned with the environment. The Archives Room consists of historical items relevant to the College and forestry developments in New York State. The Special Collections Room contains many rare and valuable books and folios.

Reference service and orientation sessions are provided by the Librarians. A library handbook is published annually and a list of recent acquisitions is distributed monthly.

The Ranger School on the Wanakena Campus has a small library of approximately 1500 volumes. This collection consists of highly specialized materials required for the teaching and study programs of the school. Other Schools also maintain small collections of special resource books and materials.



III

SELECTING A STUDY PROGRAM

How can you best prepare for a career and a lifetime of activity that may last well into the 21st century in a period of rapid and unprecedented change? Whether you are a high school graduate, a transfer student, or a college graduate, your interest in the College's academic programs suggests broad concern for environmental issues and the academic disciplines on which a better environment can be based.

The College of Environmental Science and Forestry has been providing technical, professional, and graduate programs in forestry, forest products and their related disciplines for more than 60 years. Major program areas center around the *management*, the *sciences*, *engineering*, and *design* (landscape architecture) aspects of natural resources, with traditional emphasis on environmental issues and needs.

While the future is full of uncertainty and challenge, you can be sure that the need for environmental and resource managers, scientists, engineers, and designers focusing on environmental science and forestry matters, will be greater in the years ahead. The purpose of this chapter is to provide a brief overview of the range and level of programs available at the College.

Four academic program levels are discussed: Forest Technology (page 39), Baccalaureate level programs (page 20), Graduate programs (page 21), and Postdoctoral programs (page 25). More detailed program descriptions covering purposes, scope, course content, career opportunities, and special requirements are provided for undergraduate studies in Chapters IV and V are for graduate studies in Chapter VII.

THE FOREST TECHNOLOGY PROGRAM (A.A.S.)

A two-year program in forest technology leading to an Associate Degree in Applied Science is offered at the College's Ranger School located at Wanakena, New York. This program is designed to train forest technicians for practical forestry work. Major subject areas are surveying, forest mapping, estimating timber volumes, forest planting, road design, logging methods, forest protection, forest ecology, wildlife ecology, forest recreation, forest improvements, silviculture, and forest management. Training emphasis is on field work. The first year of this program is general study taken at the College or at a community college. Study terminates after two years; students interested in a professional degree in forestry are advised to enroll initially at a professional forestry college. However, graduates of the Forest Technology program who decide to continue their education may be admitted with some advanced standing by professional forestry colleges.

BACCALAUREATE LEVEL PROGRAMS (B.S.)

Management

Resources Management. This curriculum prepares professional foresters for forest land management responsibilities. It develops an understanding of the principles and practices basic to making decisions involved in managing forest lands for multiple use purposes with emphasis on the related environment and including timber, water, recreation, wildlife, aesthetics, and other forest associated values. It integrates the biological, social, and professional aspects of natural resources management with a liberal college education. The curriculum qualifies students for membership in the professional forestry society (SAF) and meets educational requirements for various Federal and state forestry positions.

Sciences

Forest Biology. This curriculum provides a broad and basic education in biology with an orientation in the principles and practices of forestry. The program is designed for those students planning graduate study in the biological sciences as well as for those seeking positions as biologists in forestry activities such as research, disease and insect control, recreation, fish and wildlife biology, and conservation. The curriculum provides a general background in the ecological, physiological, and structural aspects of biology; a thorough grounding in the physical sciences; courses in forestry; and courses in the social sciences and humanities. Students may meet state and Federal forestry positional requirements by proper selection of electives.

Forest Chemistry. This curriculum provides a solid grounding for professional work at the B.S. level in chemistry or for advanced graduate study. It provides options in wood and polymer chemistry and in biochemistry and natural products. Both options include the basic chemistry courses required of a student majoring in chemistry. Specialized courses in wood and cellulose chemistry and wood science are required, as well as background courses in physics, mathematics, and botany. By proper elective selection, students may be certified on graduation as having completed an American Chemical Society approved curriculum.

Engineering

Forest Engineering. This curriculum prepares professionals for service in engineering and developmental aspects of forest resources. It also provides a foundation for professional engineering or graduate study in forestry along with environmental understanding. The program combines the fundamentals of forestry and management with basic preparation in the principles and practices of civil or industrial engineering.

A fifth year is available in engineering at adjacent Syracuse University leading to a baccalaureate level engineering degree. Students may meet state and Federal forestry positional requirements by proper selection of electives.

Paper Science & Engineering. This curriculum prepares students for managerial and research positions in the pulp and paper industry. It provides a sound background in chemistry, physics, botany, wood science, mathematics, and chemical engineering, and specialized offerings in pulp and paper operations. Environmental aspects of such operations are emphasized. Two options are available in paper science or paper engineering.

Wood Products Engineering. This curriculum prepares students for the science, engineering, and managerial aspects of the wood-using industries. The program provides four options leading toward careers in wood science, production systems engineering, materials marketing, and building construction. The wood science students receive a basic training in the biological or physical sciences preparing them for graduate study and research. The production systems engineering option leads to careers in process development, plant design and production management; the materials marketing option trains students for careers in technical sales and management of distributive enterprises. The building construction option offers specialization in the managerial and technical aspects of construction with wood and wood-based materials.

Design

Landscape Architecture. The curriculum in landscape architecture prepares qualified practitioners for that professional field involving the arrangement of land and facilities for human use and enjoyment. The curriculum concentrates on design and the development of an artistic sensitivity in natural resource arrangement that is both aesthetic and utilitarian; an appreciation of natural forces and man's relationship to earth and man; the character of materials used in securing results with emphasis upon plants; and earth modifications and construction of facilities. It is designed for general coverage of the professional field, including a balanced integration of general education. It provides a foreign or off-campus study semester placing emphasis on the cultural aspects of the physical environment. The program interrelates with course work available at the School of Architecture at Syracuse University. Successful completion after four years leads to a B.S. degree in Environmental Studies. A fifth year leads to a Bachelor's in Landscape Architecture. The program is accredited by the American Society of Landscape Architects.

GRADUATE PROGRAMS (Masters & Ph.D.)

Resources Management

Forestry Economics. Graduate study emphasizing the economic aspects of forestry is offered in programs leading to Master and Doctor degrees. The Masters' programs are designed to meet the needs of the graduate in forestry or forest products. They also serve the graduate in liberal arts, engineering or business whose interests point toward the economics of forest resource management. The aim is primarily to broaden the student's under-



standing of the content of forestry economics. The Doctoral program is for those who wish to make a career as professional forestry economists in research institutions, in the academic world, or in business or government. The goals are depth of understanding and familiarity with economic tools contributory to making competent decisions in resource economics, management, and policy.

Forest Management. An emphasis on Administration and Management prepares graduates for executive planning, budgeting, programming, operating, or general leadership responsibilities in public agencies or businesses concerned with natural resources or environmental quality. Forest Mensuration and Biometrics is a concentrated study area that offers highly sophisticated courses in mensuration and operations research, and in all phases of statistics and statistical design.

Forest Recreation is a third major area of graduate study in management. Of special support significance is the Recreation Research Branch of the Northeastern Forest Experiment Station of the U. S. Forest Service, located at the College of Environmental Science and Forestry.

Silviculture. Graduate study in all aspects of silviculture and its supporting sciences is available. Emphasis may be placed on fundamental biological relationships or on applications of these relationships in the forest environment. Graduate emphasis may be directed to silvics, silviculture, forest stand development, forest influences and watershed management, forest tree genetics and tree improvement, forest meteorology and climatology, forest soil physics and forest soil fertility-nutrition, and site relations. Concern for the forest ecosystem provides a major focus for graduate study in this area.



Sciences

Forest Botany & Pathology. Graduate programs are offered in the fields of anatomy, morphogenesis, physiology, ecology, forest pathology, mycology, genetics and taxonomy. Minors may be taken in soils, wood chemistry, and biochemistry.

Students interested in programs of study directed toward broad biological applications or resource ecology (i.e., environmental biology, tree pest control, conservation ecology, etc.) may elect to take a Master of Forestry degree to achieve these aims.

Forest Chemistry. Graduate programs are offered in areas of Polymers, Natural Products & Biochemistry. Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance to forestry. Therefore, this department is active in the following research areas: polymer chemistry, wood chemistry, biochemistry, chemistry of natural products, including ecological chemistry, and organic materials sciences.

Forest Entomology. Graduate study areas include not only classical studies on the biology of forest insects and those causing the deterioration of wood, but also a wide variety of special studies such as host-parasite relationships, host selectivity, insect physiology, mechanisms and enzymology of insecticide detoxification, biochemical systematics, comparative behavior, taxonomy, histology and cytology. Selected problems may also concern chemical, biological, and silvicultural aspects of insect control.

Forest Zoology. Graduate studies in forest zoology include both basic and applied research on animals of the forest ecosystem, including its associated soils, water and related wildland areas. Programs are offered in vertebrate ecology, soil invertebrate ecology, endocrinology and physiology, population ecology, animal behavior, forest wildlife biology, aquatic ecology, and forest wildlife management.

Design

Landscape Architecture. Advanced degrees are limited to the Master of Landscape Architecture. The location of the School of Landscape Architecture within the College of Environmental Science and Forestry, and adjacent to Syracuse University, provides for strong support in ecology, the natural sciences, resources management, recreation, and for development of diverse programs integrated with architectural planning and urban studies, and with the social and behavioral sciences.

Students with undergraduate degrees in landscape architecture may develop further their skills in the landscape design process or expand their background in environmental concerns. Those whose undergraduate work has been in other areas focus directly on landscape architectural studies or the application of their knowledge to the profession of landscape architecture.

Engineering

Forest Engineering. Graduate study in this department emphasizes photogrammetric and geodesic engineering. Master's and doctoral programs are structured to meet the special needs of qualified students.

Paper Science & Engineering. This graduate program offers opportunities for obtaining Master of Science and Doctor of Philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Major study areas in the Department are: physics and chemistry of pulping and bleaching; physical properties of fibers; characteristics of the paper web; chemical engineering operations as related to the pulping and papermaking processes; utilization of new raw materials, flow properties of papermaking materials. Advanced courses are offered in such diverse areas as engineering, physical and organic chemistry, polymer chemistry, paper physics, and fiber morphology.

Wood Products Engineering. Graduate study is in wood materials science, wood technologies, production engineering in the wood products industries, and wood products distribution. The principal objectives are to develop originality and the analytical approach to problem solving. The student may emphasize the mechanical properties of wood, structure and anatomy of wood, cellular ultra-structure, quality of wood, processing of wood into various forms and products, design of wood structures, industrial management of wood manufacturing plants, distribution of wood products, organic materials science, physical chemistry of wood treatments, fluid treatments and wood physics.

Interdisciplinary Programs

Three formal interdisciplinary programs are available.

World Forestry. Graduate study in this field supplements and enriches the student's technical forestry knowledge and provides the broad background deemed necessary for effective service in world forestry. This includes service as forestry advisor, teacher and research specialist with national and international agencies, with private business and industrial firms, and with philanthropic foundations and voluntary service organizations whose activities include the development and use of forest resources in other lands.

At the Master's level, program emphasis is on the attainment of general competence in foreign language, cultural anthropology, world geography, history, and international affairs, plus a broad understanding of the world forestry condition.

At the doctoral level, program concentration is on a specialized discipline such as forest botany, forestry economics, forest management, silviculture, or wood products engineering.

Water Resources. This program emphasizes the multidisciplinary aspects of water resources at the doctoral level. There are no specific required courses. Attention is given to the particular objectives of each student who enrolls in the program. Within the framework of the general graduate study requirements of the College, courses, problems and seminars are selected to accommodate the specific objectives and special interests sought by the student. The Water Resources Program makes available to graduate students pertinent resources of the College and of Syracuse University, and where appropriate, those of other units of the State University.

Organic Materials Science. Organic Materials Science is that segment of the natural sciences that deals with structure-property relationships in organic materials. Graduate programs are available at both the master and the doctoral level. Because of the breadth of the field, it is expected that most students will work toward the doctoral degree. Programs consist of carefully selected course work and research which build upon the individual student's undergraduate background and experience. Entering students are expected to have a Bachelor's degree in Wood or Paper Science, Polymer Science, Chemistry, Physics, or Engineering. The course work is directed toward background preparation in solid state and polymer science. Research topics permit the student to explore in depth an aspect of organic materials in which he has a particular interest.

Postdoctoral Training

The College of Environmental Science and Forestry has long had an informal postdoctoral training program. A year or two of advanced study enables an individual to obtain both a diversity of experience in a highly specialized area and more intensified training for his chosen career. Post-doctoral students are generally sponsored by an individual faculty member. He provides the support and arranges for the facilities needed.



IV

UNDERGRADUATE STUDY

HOW TO PREPARE FOR THE COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Your admission to the College will be based on your academic qualifications after careful analysis of data provided by your high school or other scholastic records, standardized tests, and school recommendations. In many cases an interview may be held to assess interests and scholastic abilities.

Minimum requirements are at least 16 units as follows: English, four units; history (social studies), two units; science (at least one unit in chemistry or physics), two units; mathematics (through trigonometry), three units; and electives, five or more units. A foreign language and mechanical drawing are recommended electives.

COLLEGE LIFE

Your freshman year will likely set the pattern of your undergraduate education. You will probably determine your standard of scholarship and the degree of participation in extracurricular activities for your college career. You will decide upon objectives and activities important to you. The management of your time for study, work or play, and the responsibility for your every action will rest with you. This is the period when you will make new friends and find your place in a new environment.

Orientation

To help ease the adjustment to college life, ALL FRESHMEN AND NEW TRANSFER STUDENTS are required to attend an orientation period during registration week of the Fall semester. Here you will meet your classmates and members of the faculty and administration. You will become acquainted with the College, its functions and operation, and the various services available to you. A special orientation for foreign students is provided through the Office of International Forestry.

A weekly one-hour orientation course, General Forestry 032, is required throughout the semester for all freshmen students, including freshmen transfer students. In addition, a shorter orientation program is required for transfer students. During the early formative period in your college career, you will learn what is expected of you, and where to get help when you need it. Most of all, you will become acquainted with the general college policy which affects every student throughout his academic career.

Work Load

Classes, laboratories, and study will occupy by far the greatest portion of your time at the College. Even though you anticipate working harder

than ever before at college, you will find that it requires more time than you expected. The average freshman spends about 24 hours a week in class, and at least a like amount of time in out-of-class study. The usual credit hour load is 17.

Even so, you will have reasonable opportunity to participate in extracurricular activities. In these activities you will find social and recreational outlets and develop qualities of leadership, strengthen cultural and religious interests, and broaden your experience with people and organizations.

Extracurricular Activities

STUDENT GOVERNMENT: As a member of the student body, you will participate in the election of class officers and the Student Council. The Council is the official representative body governing extracurricular student affairs. It supervises and finances a number of student activities.

PUBLICATIONS: The KNOTHOLE is a newspaper published weekly during the school year. It contains both news and opinion and is produced entirely by its student staff. The EMPIRE FORESTER is the College yearbook, and has a long tradition of excellence. It is published by a student staff with a faculty advisor.

PROFESSIONAL AND DEPARTMENTAL ORGANIZATIONS: There are several opportunities for you to join clubs that will advance your knowledge and broaden your acquaintance with students of similar interests. Following is a list of these organizations: Archery Club, Botany Club, Forest Engineers Club, Forestry Club, Mollet Club (landscape architecture), Papyrus Club, Wood Engineers' Club, Forest Zoology Club, and the student chapters of the Wildlife Society and the Society of American Foresters.

OTHER ORGANIZATIONS: Vox Silvae is an organization to improve the public speaking ability of students through debate. Robin Hood is the all-College junior honorary society. Alpha Xi Sigma is the senior honorary society. Saengerbund is the College glee club.

Syracuse University

As stated previously, the College of Environmental Science and Forestry is located adjacent to Syracuse University and a close relationship between the two institutions has been maintained through the years. Students may participate in Student Government, organizations and other extracurricular activities at Syracuse University.

COURSES: Some of the required course work in general education and basic physical sciences at the College is taken at Syracuse University. College of Environmental Science and Forestry students may also take electives related to their programs of study **upon receiving their advisors' approval.** Courses taken at Syracuse University are covered by the tuition and fees of the College of Environmental Science and Forestry.

LIVING ON CAMPUS: Residence in a Syracuse University living center or an approved sorority house (upperclasses only) is required of all under-

graduate women, although permission may be secured from the Office of Residential Life to live with blood relatives if the parents are willing to transfer all responsibility for the student to the relative concerned.

All men are required to live in University dormitories, and the University accepts the responsibility for the housing (dormitories or fraternities) of all undergraduate men.

Syracuse University housing units are available for married students. Veterans are given preference, but there are ordinarily apartments for non-veterans.

ATHLETICS: Payment of a student athletic fee entitles students to admission to University home athletic events upon presentation of the official identification card, and the same applies to full-time graduate students.

Athletic facilities for men include Archbold Gymnasium, which houses basketball courts, handball and squash courts, a rifle range, rowing tank, and a championship-size swimming pool. A ski tow and lodge on University property at Skytop are centers of much interest and recreation during the winter. There are 22 tennis courts at the University. The Manley Field House provides indoor practice facilities for many sports, including football, baseball, track, and lacrosse, and is the site of home basketball games.

Sports and dance activities for women offer the opportunity to acquire skill and understanding of these activities through the Department of Physical Education for Women.

COLLEGE SERVICES

Academic and Personal Counseling

The Office of Student Affairs is available throughout your college career as a place where you may seek, at any time, the advice of experienced counselors. This office should be your first contact when questions or personal problems arise. General advisement for foreign students is provided by the Office of International Forestry. The Registrar in the Student Affairs Office is available as needed to provide information and guidance on general academic and specific program requirements. In addition, the Coordinator of Financial Aids in the Student Affairs Office provides information on available scholarships, long-term state and Federal educational loans, work opportunities at the College and major financial problems.

Traditionally, the College faculty has placed emphasis on academic advisement both formally and informally to meet individual student needs and considers this close faculty-student association to be a major academic strength. During registration you will be assigned to a faculty advisor to assist you as needed in your curriculum decision, program development, and elective decisions. When you select a curriculum, special advisors will be assigned to provide academic advice as needed. Faculty in your major department are available also for academic guidance. In addition, many classes are small, permitting students ample opportunity to discuss their courses and professional aspirations with instructors. While advice and counsel are available on an individual basis as needed, students at the

College are encouraged early in their careers to become independent and responsible for their academic decisions as will be required in later professional life.

Other Counseling

Full-time ministries are provided in all the major religious groups. They center their programs at Hendricks Chapel, except for Roman Catholics, who are served at Saint Thomas More Chapel. The Dean of Hendricks Chapel coordinates religious activities, working with eight full-time and six part-time denominational chaplains and advisors. The program of Saint Thomas More Chapel is under the direction of a chaplain.

Extracurricular activities are under the guidance of a faculty committee, the members of which meet with students during planning sessions and offer their counsel when necessary.

Resident counselors are located in all dormitories, and are available for help and assistance if needed.

As students reach the end of their undergraduate years, they often seek career guidance. Highly motivated students should consider the question of whether or not to continue their education in graduate school. At the College, this sort of counseling is handled by the departments or divisions in which you take your major work. At the completion of your college career, placement counseling is available.



Health and Medical Facilities

Students may consult a physician for medical care or health advice at the Syracuse University Student Health Service, and are entitled to unlimited visits to the out-patient clinic and also 10 days of confinement with ordinary medical care in the Infirmary per college year. Infirmary usage over 10 days will be at prevailing Infirmary rates. The usual laboratory examinations, if necessary for treatment or diagnosis of common illness, are in the main provided without cost. Most common legal drugs are provided without extra charge.

A student accident or sickness insurance plan is available and not only supplements the usual Infirmary privileges, but is also a health protection during the summer months when students are not under care of the Health Service. Married students with dependents who are not covered by Health Service privileges are strongly urged to provide themselves and their families with special insurance made available to University students. *All foreign students are required to carry health and accident insurance.* Graduate student insurance requirements are explained in Chapter VII.

Military Service

The Registrar's Office keeps on file up-to-date information on Selective Service. A request for draft deferment as a college student, of course, must be made by you and certified by the Registrar. Students reaching 18 years





of age after arriving in Syracuse may register with Selective Service in the Office of Student Affairs.

Air Force and Army Reserve Officer Training Corps programs are available; however, a minimum of two years is required.

Hearing and Speech Center

The Gordon D. Hoople Hearing and Speech Center provides remedial assistance to all regularly enrolled students who may be handicapped by hearing, speech, and voice disorders. This service is without expense to students.

Psychological Services and Research Center

Students desiring an analysis of their aptitudes, abilities, and interests may secure special testing programs at the Testing and Evaluation Service Center in Sims IV.

Reading Center

The School of Education, in cooperation with the College of Liberal Arts and the Psychological Services and Research Center, maintains a reading laboratory for research in the learning skills and for training teachers and specialists in reading. Representatives from the fields of medicine, speech, and psychology cooperate in making diagnoses and in planning

remediation. Large numbers of University students use this facility to improve their reading skills.

COLLEGE REGULATIONS

The complete rules and regulations governing all students while attending the College of Environmental Science and Forestry, and residing on the Syracuse University Campus, are included in a separate publication entitled *Undergraduate Student Handbook*. It may be obtained from the Office of Student Affairs, and is distributed to students at registration. However, it is the student's responsibility to secure a copy and become thoroughly familiar with it. The following information does not endeavor to prescribe in detail what is either permitted or denied, but rather is confined to some of the basic academic regulations and procedures of interest to entering students.

Course Selection

Courses are to be chosen in accordance with the regulations of an established degree program, and it is the student's responsibility to plan his program so that all degree requirements are met.

Course Load

Normally, a full-time undergraduate student will register for a minimum course load of 15 to 18 hours.

Late Registration

A student who fails to report for registration or fails to complete registration during the authorized period, is subject to a penalty unless excused by the Vice President for Student Affairs or his representative.

Assignment of Grades

In each course final grades are given at the end of the semester and are expressed in letters as follows: A—excellent, B—good, C—average, D—minimum passing, F—failure, INC—incomplete, and in theses courses, S—satisfactory, U—unsatisfactory. An incomplete must be made up within one semester or an F is recorded.

Grade-Point Average

For the purpose of determining grade-point averages, letter grades have the following values: A, 4 points for each semester hour; B, 3 points for each semester hour; C, 2 points for each semester hour; D, 1 point for each semester hour; and F, no points. Both semester and cumulative scholastic averages are computed by dividing the total grade points accumulated by the total credit hours carried. Only courses carried at the College of Environmental Science and Forestry or Syracuse University, including Utica College and University College, are used to compute grade-point averages.

Academic Standards

A student whose cumulative or semester average falls below 2.00 (C) will have his record reviewed by the Academic Standards Committee. If the record indicates that he might be able to meet the requirements later, he will be placed on probation. If, however, in the judgment of the Committee, he will not be able to meet the requirement, he will be academically dismissed. Freshmen are not normally dropped at the end of the first semester. They must achieve a 1.7 cumulative average or better at the end of the second semester to be eligible to continue at the College.

Graduation Requirements

A student will be recommended for graduation only if he has completed the required courses prescribed for his major, and has a minimum average of 2.00. In general, this requires four years' work,* either at this College or in some other College of approved standing. Residence at this College during the final year is obligatory. In some degree programs there are requirements which must be completed during one of the summer periods.

Academic Honors

Students achieving a 3.0 (B) average or above for the semester are placed on the President's Honor List and a commendation is sent by the President to both students and parents.

Graduation Honors: A student is recommended for the Bachelor degree *summa cum laude* if his average for the four years is 3.83 or better; for the degree *magna cum laude* if his average is 3.34 to 3.82; and for the degree *cum laude* if his average is 3.0 to 3.33.

*Two years for A.A.S. degree in Forest Technology.



COST OF ATTENDING COLLEGE

The tuition and fee structure includes library, health, infirmary, physical education, R.O.T.C., special testing and other services, as well as an assessment for student activities and charges for expendable supplies and equipment. A nonrefundable application fee is required. Each applicant will be billed for this fee after receipt of the application. No fee is required of transfers from other units of the State University of New York. (Graduate students refer to Chapter VII.)

Residents of New York State

Total tuition and fees to be paid as follows:

Advance Payment* (New and transfer students only)\$ 50.00

Due at August registration:

Lower Division** 362.00

Upper Division 437.00

Due at January registration:

Lower Division 334.00

Upper Division 409.00

Non-Residents of New York State

Total tuition and fees to be paid as follows:

Advance Payment* (New and transfer students only)\$ 50.00

Due at August registration:

Lower Division** 574.50

Upper Division 687.00

Due at January registration:

Lower Division 548.50

Upper Division 659.00

* Advance payment of \$50 is requested within 30 days from the date of acceptance and no later than May 1; it is refundable up to May 1. The advance payment will be credited to Fall tuition for freshmen and transfer students.

** Lower Division is usually freshmen and sophomores; Upper Division is usually juniors and seniors.

Other Costs

A commencement fee of \$10 is required at the beginning of the semester in which the degree is expected.

Housing costs at Syracuse University range from \$550 to \$780 for 34 weeks depending upon the size of the room. Most rooms are for two students and are furnished with beds, mattresses, pillows, desks, chairs, study lamps, and dressers. A commercial linen service operates on campus and is available for those who order it.

Board Costs at Syracuse University range from \$436 to \$750 for 34 weeks. Housing and board rates are subject to change and inquiries about them should be sent to: Office of Residential Life, Syracuse University, Syracuse, New York 13210.

Other expenses, including books and supplies, average about \$75 for the fall semester and \$75 for the spring semester. Certain curricula require a summer session in field forestry following the sophomore year, which lasts for 5 weeks and costs approximately \$175, except the Cranberry Lake Biological Station, costing approximately \$450 total for full session. Extended field trips, lasting up to three weeks, are required in landscape architecture, and wood products engineering, and these range in cost from \$100 to \$200.

Terms of Payment

A check or money order for tuition and fees should be made payable to "State University College of Environmental Science and Forestry," and payment is made at the Business Office of the College. The advance payment should be mailed to the Business Office, College of Environmental Science and Forestry, Syracuse, New York 13210.

*Payment for housing and board is made directly to Syracuse University.**

Refunds

The following policies shall apply to tuition liability and refunds for students canceling their registration.

A student who is given permission to cancel his registration shall be liable for payment of tuition in accordance with the following schedule:

<i>Liability During</i>	<i>Semester</i>
1st week	0
2nd week	30%
3rd week	50%
4th week	70%
5th week	100%

No money shall be refunded unless application for refund is made within one year after the end of term for which the tuition requested to be refunded was paid to State University. The first day of class session shall be considered the first day of the semester and Saturday of the week in which this first class session occurs shall be deemed the end of the first week for refund purposes. It is interpreted that a student who does not attend any class sessions after Saturday of the first week and who notifies the College of his intent to cancel registration on or before the second Saturday following the first day of classes shall be deemed to have canceled his registration during the first week.

There shall be no tuition or fee liability established for a student who withdraws to enter military service prior to the end of an academic term for those courses in which he does not receive academic credit.

A student who is dismissed for academic or disciplinary reasons prior to the end of an academic term shall be liable for all tuition and fees due for that term.

*Except for the Ranger School.

A student who cancels his registration at a unit of the State University and within the same term registers at another unit of the State University, shall be entitled to full credit for tuition and fees paid for that term.

Notwithstanding any other provisions for refund, when a student has withdrawn through circumstances beyond his control, under conditions in which the denial of refund would cause undue hardship, the Chief Administrative Officer of the unit, may, in his discretion, determine that no liability for tuition has been incurred by the student, provided the student has not completed more than one half of the term and has not received or will not receive academic credit for the term. Such action, including the reason therefore, shall be in writing.

FINANCIAL AID

It is easier today than ever before to finance a college education. Various types of scholarships, government aid, and loans are available at the College of Environmental Science and Forestry for students who need financial assistance. Scholarships and loans are often obtained from sources in the students' home communities, such as companies, fraternal organizations, service clubs, churches, alumni groups, and the like.

Complete information on financial assistance may be obtained from the Coordinator of Financial Aids at the College, either directly or by mail. Some of the various types of aid, however, are listed below:

For New York State residents, the Scholar Incentive Program, Regents Scholarships, and State University Scholarships offer possible financial aid. The New York Higher Education Assistance Corporation offers loans to residents which are interest free until 9 months after college, and then draw 7 percent annual interest. Repayment of a loan cannot be scheduled for more than a 10-year period.

Any undergraduate student in good standing and who needs financial assistance may borrow up to \$1,000 per year (graduate student \$2,500) under the Student Loan Program of the National Defense Education Act of 1958. No interest will accrue until 9 months after college, and part of the loan will be canceled if the student becomes a public elementary or secondary school teacher or college teacher. A 10-year repayment period is allowed.

The College is a recipient of funds from the Higher Education Act of 1965. These funds enable the College to award Educational Opportunity Grants to students who have exceptional financial need. These grants range from \$200 to \$1,000 per year.

The College of Environmental Science and Forestry Alumni Association offers a variety of assistance. Memorial scholarship awards are made to outstanding students; interest-free loans are available to meet emergency expenses, and several educational grants ranging from \$100 to \$500 each are made each year.

A limited number of tuition waivers are available for award to qualified foreign students.

Special financial assistance includes the following: Charles Lathrop Pack Awards, Charles Malcomb Harlow Memorial Loan Fund, Friedrich U. Klahn Memorial Scholarship in Silviculture, David B. Schorer Memorial Fund, Edward Vail Emergency Fund, C. Ives Gehring Memorial Fund, James D. Judson Memorial Fund, Portia Farrell Morgan Scholarship, Jack L. Krall Memorial Scholarship Fund, Boston Paper Trade Association Scholarship, Phyllis Roskin Memorial Award, State University at Syracuse Chapter of CSEA Scholarship, and the Student Association Grants.

Other opportunities include: Allied Paper Salesmen's Association Award, Harold L. Austin Memorial Scholarship, Boxboard Research and Development Scholarship, Nelson Courtlandt Brown Scholarship Fund, Henry H. Buckley Student Aid Awards, Geigy Dyestuff's Scholarship, C. E. Libby Award, Milton Conservation Club Award, Frank B. Myers Memorial Award, New York-Canadian Division of Paper Industry Management Association Scholarship, Pen-Jer-Del Division of the Paper Industry Management Association Scholarship, Plastics Engineer's Award, St. Regis Paper Company Scholarship, and Syracuse Pulp and Paper Foundation Scholarships.

In addition, work grants are available to pre-freshmen; there are part-time work opportunities at the College, and the Economic Opportunity Act of 1964 offers a work-study program.

HOW TO APPLY FOR ADMISSION

Entering Freshmen

To apply for admission if you are a resident of New York, you should request the proper forms from your local high school guidance office; for nonresidents you should request them directly from the College's Office of Admissions. **HOWEVER, IN EITHER CASE YOU MUST OBTAIN DIRECTLY FROM THE OFFICE OF ADMISSIONS ADDITIONAL SUPPLEMENTAL FORMS OTHER THAN WHAT YOU MAY OBTAIN FROM YOUR GUIDANCE COUNSELOR.**

Allow about three to four weeks for delivery of this material. Revised admissions forms are available beginning August of one year for entry the following year.

The target date for final decision on most freshmen applications for August entry is May 1. Freshman applicants will begin to receive notification of the admissions decisions after February 15. Freshmen are not generally admitted to the College in January. A copy of the decision letter on an application is sent to the applicant's high school guidance office. (Graduate students refer to Chapter VII.)

APPLICATION DEADLINE FOR FRESHMAN ADMISSIONS IS MARCH 1.



Transfer Students

Students with previous college experience or who are currently enrolled at another college may apply for transfer. It is college policy that any student who is academically dismissed must wait at least one semester before applying to this college.

Applications should be obtained directly from the college by writing to the Director of Admissions, Attn: Transfer. Allow three to four weeks for delivery of this material. Revised application forms are available beginning in October for admission the following year.

Students with two years of college can generally arrange their programs to allow transfer to the College of Environmental Science and Forestry with a junior standing. Courses transferred for credit must be appropriate to the student's curriculum choice and successfully completed with a passing grade (D or better)*. In addition, courses to be transferred as required courses in a curriculum must be comparable in content. Course credit hours are transferred, but grades and grade points are not transferrable.

In applying to the College for transfer, it is your responsibility to submit a recent official transcript from the college you are currently attending, and similar documents from all colleges previously attended. Also, a catalog from each college may be required.

APPLICATION DEADLINE FOR TRANSFER STUDENTS IS MAY 15.

Forest Technology Applicants

Students desiring application to the A.A.S. degree program in Forest Technology should request application materials from the College by writ-

*Note: Students who transfer courses in which a grade of "D" has been earned must be aware of possible deficiencies when that material is used in upper division classes.

ing to the Director of Admissions, Attn: Forest Technology. Applicants who have completed some college work or who are currently attending college must submit official transcripts and a list of courses to be completed by the time of enrollment so that transfer credit can be awarded.

International Students

The College accepts international students on the undergraduate level if they can satisfy all regular admissions requirements. It is recommended, however, that students from foreign countries obtain their baccalaureate degree in their home country if at all possible and apply to the College as a graduate student. Experience has shown that this arrangement provides for greater academic achievement and more efficient use of the student's time and funds. If an international student wishes to apply as an undergraduate, he must meet the secondary school requirements for entrance; show that he is proficient in the English language through acceptable results of the TOEFL test and/or College Entrance Examination Board Achievement Test in English; provide competitive scores on the C.E.E.B.'s Scholastic Aptitude Test in the verbal and math areas; and produce evidence that he can meet all financial obligations.

Undergraduate foreign students must file official State University of New York admissions forms. These may be obtained by writing to the Director of Admissions at the College. No fee is required for processing the application. If the foreign student is accepted, he must obtain adequate health and accident insurance before he will be allowed to register at the College.

International students who are currently enrolled at an American college may apply for transfer to the College. They must meet all regular entrance requirements plus those of a transfer student as listed on page 39. Permission to transfer must be obtained from the U. S. Immigration and Naturalization Service district office having jurisdiction over the college in which the student is currently enrolled.

Admission Examination

State University of New York requires resident applicants to take the New York Regents Scholarship Examination (administered only in early October in most high schools in New York) if the applicant is residing or attending school in the State during the year prior to entrance to college. If an applicant does not take this test, he must submit the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB) or the American College Test (ACT). The College Director of Admissions may waive the requirement for, (1) applicants from outside New York State, who must substitute scores earned in the Scholastic Aptitude Test of the College Entrance Examination Board, or the American College Test, (2) late applicants, and (3) applicants for admission as transfers from another college.

Health Examination Report

Each new student is required to submit a history and physical examination report on a form that will be sent after the initial acceptance notice. *It is to be completed and returned within two weeks to the Admissions Office, State University College of Environmental Science and Forestry, Syracuse, New York 13210.*

Entrance with Advanced Standing

Secondary school students may earn college credit toward the B.S. or B.L.A. degree before enrolling as freshmen at the College. This enables students to carry enriched course loads, and may be accomplished in two ways:

1. Evening and Saturday courses in mathematics or English, for instance, given by a nearby college may be open to recommended high school seniors. After successful completion, an official transcript or other appropriate document should be sent to the College by the institution along with a catalog description of the course or courses.

2. College-level courses given by high schools in the Advanced Placement Program of the College Entrance Examination Board to recognize and develop academic talent. Such courses as biology, mathematics, chemistry, English, and foreign languages offer opportunity for degree credit at this College. The determination of credit is made by faculty members to whom the student's final examination papers are sent after they have been graded.

College Proficiency Examinations

The New York State College Proficiency Examination Program is a means by which students may receive college credit for specific courses by examinations, without being in residence for a course or taking structured correspondence lessons. The College also accepts the College Level Examination Program (CLEP) of the College Entrance Examination Board. These examinations are open to all who make application.

The College approves of the CPE and CLEP programs in general and will evaluate the performance of participants. Satisfactory performance by a student must be demonstrated during at least one semester in residence at this College before granting credit. This residence may be prior or subsequent to the examination.

If all College policy requirements are met, grades A and B will receive credit; credit for a grade of C will be granted only upon recommendation of the department of the applicant's major; and no credit will be granted for a grade lower than C.

Application for credit should be made to the Office of Student Affairs. Application for deviation from the prescribed policy may be made to the Academic Standards Committee for undergraduate credit and the Committee on Graduate Studies for graduate credit.



V

UNDERGRADUATE PROGRAMS

ENTERING FRESHMEN

The seven curricula described in Chapter III lead to a Bachelor of Science degree and five-year Landscape Architecture curriculum leads to a Bachelor of Landscape Architecture degree.

Entering freshmen will review the demands and opportunities of the curricula with an assigned advisor during the registration period, in order to select the first-semester elective. Before the end of the first semester, however, each freshman must make his curriculum choice. In reaching this decision he will be assisted as needed by faculty advisors, the Office of Student Affairs, by conversations with upperclassmen, and by first-hand acquaintance with the College's programs, facilities, and personnel.

FRESHMAN YEAR — FIRST SEMESTER — ALL CURRICULA

		<i>Credit Hours</i>
F. Botany 100	General Botany	4
English	Freshman English	3
Mathematics		3
*Chemistry 106	General Chemistry	4
*Elective		3
Orientation		0
Phys. Educ. or ROTC		0
		—
		17

Students interested in meeting the education requirements for initial professional positions in Federal and state resource managing agencies are able to qualify fully by successful completion of either the Resources Management curriculum or the Forest Engineering curriculum. They may also do so in the Forest Biology curriculum through selection of appropriate forestry courses as electives, under guidance of a faculty advisor.

TRANSFER STUDENTS

The College of Environmental Science and Forestry has designed its undergraduate curricula to accommodate entering transfers from two-year and other colleges. Students taking recommended course series or Associate degree programs containing specified courses generally may register at the entering junior level without credit loss. The various course or program requirements for effective transfer are listed in each curriculum description

*Students who definitely know they are going to pursue the Environmental Studies and Landscape Architecture Curricula will substitute Philosophy 105, 3 credit hours, for Chemistry, 4 credit hours, and will take Graphics 182: Art Media I, 1 credit hour, as their elective, for a total semester load of 14 credit hours.

in the following section. A transfer student will be held responsible for the total credit hour requirement of the curriculum into which he enrolls, including special summer sessions, field trips and/or summer employment as required in that major.

The Admissions Office will be pleased to answer questions concerning transferring, and to evaluate records and advise on courses where there are questions. Students applying for transfer will generally follow the admissions procedures described on page 39.

DUAL ENROLLMENT WITH TWO YEAR COLLEGES

The College of Environmental Science and Forestry has completed an arrangement for a dual enrollment program with the Columbia-Greene Community College for those students who wish to transfer to the College. Any applicant for the Liberal Arts, Math and Science program with a Forest Management concentration at the two-year college is evaluated by both institutions. Upon acceptance and successful completion of the Associate in Science degree, the student is automatically accepted to the College of Environmental Science and Forestry. Dual enrollment programs may be expanded to other two-year colleges in the near future.

THE SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

The School of Biology, Chemistry and Ecology offers two curricula supporting the science and ecological areas of environmental science and forestry.

Forest Biology

The Forest Biology Curriculum is designed to educate biologists, and to provide them an orientation to forestry principles. This program was developed for those students planning graduate study in the biological sciences as well as those seeking positions as forest biologists in forestry, such as forestry research, disease and insect control, recreation, fish and wildlife biology, or conservation. The effective management and protection of forests and related natural resources are becoming increasingly dependent on the research contributions and professional guidance of biologists for solutions of a wide range of natural resource problems.

The curriculum is built around a core of required courses which provides a sound background in biology and the physical sciences, an introduction to forestry principles, and a general education. It is designed to achieve breadth in biology as well as depth in a selected concentration area. The Forest Biology Curriculum is flexible and a variety of programs may be developed within or across the various participating departments to meet the academic goals and special subject interests of the student. Each student is assigned an advisor to aid in program decisions. All students are considered to be majoring in *biology*.

General requirements for Federal and state biology positions are met. Position requirements in a broad range of special biological fields related to natural resources also may be achieved by selection of electives. Requirements for Federal and state forestry positions may be satisfied by choosing specified forestry subjects as electives.

The curriculum has been arranged to facilitate transfer of students from the State University community colleges at the end of their freshman or sophomore years. Recommended core courses for students planning to transfer as entering juniors total 64 credits or an Associate degree and include:

Biology	8 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
Physics	8 credits
Mathematics through Integral Calculus	8 credits
Economics	3 credits
English	6 credits
*Electives	14 credits

Attendance at a 5-week Summer Session course in Field Forestry at the Pack Demonstration Forest, Warrensburg, New York, is required. In special cases, attendance at the Cranberry Lake Biological Station or its equivalent may be substituted (see note 2 below).

In addition to the courses specified in the program, students must meet the following requirements:

- 1) Twelve credits in a selected biology concentration (zoology or wild-life biology, botany, forest entomology, silvics).
- 2) Six credits in a second biological area.
- 3) The courses selected in the concentration subjects should include at least one from each of three of the following broad areas of biology: physiology, classification, structure-development, and ecology.
- 4) Three credits in the resources management area.
- 5) Nine credits in the humanities and social sciences selected with the approval of the faculty advisor.
- 6) Twenty-seven credits in elective courses selected with the approval of the faculty advisor.

ELECTIVES

1. Students planning graduate study are urged to take two semesters of a language (as approved by their faculty advisor) as a part of their humanistic-social sciences electives requirement.
2. Students planning to meet special requirements for biology specialty positions in Federal and state service should review the available Civil Service publications and become familiar with the specific course requirements to be met by elective substitution with the approval of the faculty advisor.

*To include 3 courses totaling 9 credits in the humanities and social sciences.

3. Students planning to meet special requirements for Federal Civil Service positions in forestry at the GS-5 and GS-7 levels may do so by electing 10 credits in additional forestry courses and attending the Summer Session in Field Forestry at Warrensburg, New York. These special forestry requirements may be fulfilled by courses selected with the approval of the faculty advisor.



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1. *Mathematics through integral calculus (Math 227 or the equivalent) is required.
 2. **Students with a 2.5 academic average or better may substitute for this requirement 8 credit hours of courses at the Cranberry Lake Biological Station or a minimum of 6 credit hours at other biological field stations. The courses selected must have the approval of the student's advisor. A minimum of 6 credit hours is required, and it is preferable that the summer program be taken between the junior and senior years.
 3. Five credits of additional forestry courses are recommended for those students not attending the Summer Session in Field Forestry.
 4. A total of 131 credit hours is required in this curriculum.

FOREST BIOLOGY CURRICULUM

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
Chem 106	General Chemistry ..	3	Chem 116	General Chemistry ..	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Engl 101	Freshman English ..	3	Engl 102	Freshman English ..	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
G F 032	Orientation	0			—
					17

Sophomore Year					
F Chem 221	Organic Chemistry I.	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry Lab I	1	F Chem 224	Organic Chemistry Lab II	1
Phys 103	General Physics	4	Phys 104	General Physics	4
F Biol 320	General Ecology	3	F Econ 300	Intro to Macro Economics	3
Electives		6	Electives		6
					17

Summer Session Alternate A** SUMMER SESSION IN FIELD FORESTRY. 5 weeks—6 credit hours. This program is conducted in two separate sessions during the summer period at the College's Pack Demonstration Forest near Warrensburg, New York.					
	F Biol 301	Field Biology			1
	Silvi 302	Silvics			1
	F Mgt 303	Introduction to Forest Measurements			1
	Res Mgt 304	Silviculture—Resources Management			3
**See Note 2 below.					6

Junior Year					
F Bot 210	Dendrology I	2	A Math 571	Introduction to Statistical Analysis	3
F Ento 500	Elements of Forest Entomology	3	or		
F Biol 330	Principles of General Physiology	3	A Math 591	Introduction to Probability and Statistics	
Electives		6	Geol 101	General Geology (3)	3
		—	or		
			Silvi 332	Soils	
					6
					14

Summer Session Alternate B** SUMMER SESSION IN ENVIRONMENTAL BIOLOGY 8 weeks, 8 credits. Courses selected require approval of the student's advisor. Program conducted in July-August at the Cranberry Lake Biological Station, Pack Experimental Forest, Cranberry Lake.					
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Summer Session Alternate C** Attendance at other approved biological field stations may be arranged. The courses selected must have the prior approval of the student's advisor.					
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Senior Year					
F Biol 571	Fundamentals of Genetics	3	Electives		15
F Biol 572	Fundamentals of Genetics Lab	1			—
Electives		12			
					16

Forest Chemistry

By selecting proper electives, students in either of the two following options may be certified on graduation as having completed an American Chemical Society approved curriculum. Both options are excellent grounding for professional work at the B.S. level or for advanced graduate study.

Recommended core courses for students planning to transfer as entering juniors total 64 credits or an Associate degree and include:

Biology	8 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
Physics	8 credits
Mathematics through Integral Calculus	8 credits
Economics	3 credits
English	6 credits
Electives	14 credits

BIOCHEMISTRY AND NATURAL PRODUCTS OPTION

This option is designed for students who wish to approach problems in the life sciences with the tools and point of view of the chemist. In addition to a major concentration in the several branches of chemistry, the student obtains a solid grounding in the fundamentals of physics, mathematics, and biology. Professional electives can provide a minor concentration in botany, ecology, entomology, zoology, or physiology. Collaborative efforts of chemists and biologists are providing new solutions to problems of environment, natural resources, and health.

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1. *One course of mathematics or applied mathematics beyond Math 227 or Math 397, or equivalent, is required.
 2. **A sequence of professional electives should be chosen in the junior year. In addition to the freshman biology courses, a student whose emphasis is in biochemistry must take 3 semester hours of genetics and at least another 3 semester hour biology course. A student whose emphasis is in natural products must take 3 semester hours of biology in addition to the freshman biology courses and an additional hour of organic chemistry laboratory (F Chem 496) and a second hour of F Chem 584.
 3. ***Polymer Properties, F Chem 556 (3 credit hours) is suggested.
 4. ****Petition by student to the Department for replacement of this requirement will be considered to allow time for special interest.
 5. *****G F 502 may be substituted.
 6. A total of 132 credit hours is required.

FOREST CHEMISTRY CURRICULUM

BIOCHEMISTRY AND NATURAL PRODUCTS CHEMISTRY OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany . . .	4	F Zool 100	General Zoology .	4
Chem 106	General Chemistry .	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English .	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		17			17

Sophomore Year

F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry Lab I	1	F Chem 224	Organic Chemistry Lab II	1
Engl 210	Advanced Composition and Literature	3	Engl 211	Technical Writing	3
*Math or Elective		3	*Math or Elective		3
Phys 105	General Physics for Science Students I	4	Phys 106	General Physics for Science Students II	4
Elective		3	F Econ 290	Introduction to Economics for Forestry	3
		17			17

Junior Year

F Chem 325	Organic Chemistry III	3	*Math or Elective		3
Chem 332	Quantitative Analysis	2	F Chem 584	Spectrometric Identification of Organic Compounds . . .	1
Chem 333	Quantitative Analysis Lab . . .	1	Chem 434	Instrumental Analysis	2
Chem 346	Physical Chemistry .	3	Chem 435	Instrumental Analysis Lab . .	1
**Professional Elective		2-4	Chem 356	Physical Chemistry	3
Elective		3	Chem 357	Physical Chemistry Lab	1
			**Professional Elective		2-3
			Elective		3
		14-16			16-17

Senior Year

F Chem 495	Introduction to Professional Chemistry	2	****F Chem 498	Introduction to Research	5
F Chem 575	Wood Chemistry I .	2	F Chem 497	Undergraduate Seminar	1
F Chem 578	Wood Chemistry Lab	1	F Chem 532	Biochemistry II .	3
F Chem 530	Biochemistry I	3	F Chem 577	Wood Chemistry III	2
F Chem 531	Biochemistry Lab . .	2	*****Pub Add 215	Public Speaking .	3
***Electives		6	Elective		3
		16			17



WOOD AND POLYMER CHEMISTRY OPTION

This option is designed for students interested in the structure and physical properties of man-made and natural materials, the giant molecules of wood, plastics, polysaccharides, proteins, rubbers, and fibers. The recently discovered chemistry of these materials constitutes one-half the concern of chemical industry and is the origin of a major revolution in our way of life and our understanding of nature. This special subject area is an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum.

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1. *One course of mathematics or applied mathematics beyond Math 227 or Math 397, or equivalent, is required.
 2. **A sequence of two or more professional electives in related disciplines with a minimum of 5 credits should be chosen in the fall of the junior year from the College offerings. Wood Products Engineering and Paper Science and Engineering courses are recommended.
 3. ***F Chem 530: Biochemistry I (3 credit hours) suggested.
 4. ****Petition by student to the Department for replacement of this requirement will be considered to allow time for special interest.
 5. *****G F 502 may be substituted.
 6. A total of 132 credit hours is required.

FOREST CHEMISTRY CURRICULUM

WOOD & POLYMER CHEMISTRY OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany . . .	4	F Zool 100	General Zoology .	4
Chem 106	General Chemistry .	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		17			17
Sophomore Year					
F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry	
F Chem 222	Organic Chemistry			II	3
	Lab I	1	F Chem 224	Organic Chemistry	
Engl 210	Advanced Composition and Literature	3		Lab II	1
		3	Engl 211	Technical Writing	3
*Math or Elective		3	*Math or Elective		3
Phys 105	General Physics for Science Students I	4	Phys 106	General Physics for Science Students	
Elective		3		II	4
		17	F Econ 290	Introduction to Economics for Forestry	3
					17
Junior Year					
F Chem 325	Organic Chemistry		*Math or Elective		3
	III	3	F Chem 584	Spectrometric	
Chem 332	Quantitative Analysis	2		Identification of Organic Compounds . . .	1
Chem 333	Quantitative Analysis				
	Lab	1	Chem 434	Instrumental Analysis	2
Chem 346	Physical Chemistry .	3	Chem 435	Instrumental Analysis Lab . .	1
**Professional Elective		2-4	Chem 356	Physical Chemistry	3
Elective		3	Chem 357	Physical Chemistry	
				Lab	1
			**Professional Elective		2-3
			Elective		3
		14-16			16-17
Senior Year					
F Chem 495	Introduction to Professional Chemistry	2	****F Chem 498	Introduction to Research	5
F Chem 550	Introduction to Polymer Chemistry I	3	F Chem 552	Introduction to Polymer Chemistry II . .	3
F Chem 551	Polymer Techniques	2	F Chem 577	Wood Chemistry	
F Chem 575	Wood Chemistry I .	2		III	2
F Chem 578	Wood Chemistry		F Chem 497	Undergraduate Seminar	1
	Lab	1	*****Pub Add 215	Public Speaking .	3
***Electives		6	Elective		3
		16			17

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

The School of Environmental and Resource Engineering offers three curricula supporting the engineering and environmental aspects of forestry and environmental science.


Forest Engineering

The primary objective of this curriculum is to prepare qualified graduates who will operate with professional engineering competence within the context of forestry and natural resources development. It is an engineering curriculum, fundamentally interwoven with essential principles of forestry to develop environmental understanding and ecological awareness.

The curriculum consists of a four-year program at the College of Environmental Science and Forestry preparatory to a fifth year in either civil, industrial, or mechanical engineering at Syracuse University. The Bachelor of Science degree will be awarded by the College upon completion of the four-year program; a Bachelor of Science degree in Engineering will be awarded by Syracuse University upon completion of requirements in a fifth year. Graduate programs at the College, building upon the four-year Forest Engineering Curriculum, are also possible during the fifth year.

Minimum professional requirements, both in Forestry and Engineering, are met by the core of required courses, and these are strengthened in areas suited to the student's goals through proper advisory use of the electives that may be taken throughout the program.

Graduates with Associate degrees in engineering science or science and mathematics usually find transfer acceptance as entering juniors. Students looking forward to career opportunities in Forest Engineering are urged to obtain guidance on specific requirements from the Admissions Office of the College as early as possible in their preparatory programs.

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1. Three credit hours must be elected in an upper division forestry course outside of the School of Environmental and Resource Engineering.
 2. Twelve credit hours must be elected in social sciences or humanities.
 3. *Mathematics through differential equations is required.
 4. **Electrical Engineering, thermodynamics, or advanced engineering materials, each beyond freshman physics or the equivalent of CIE 325.
 5. ***An advisor approved engineering design or synthesis course may be substituted. To be approved, the course must fit the objectives of professional forest engineering. Advanced courses in production or operational systems are suitable examples.
 6. ****An advisor approved photogrammetry course may be substituted for F Engr 503.
 7. A total of 136 credit hours is required for the B.S. degree from the College in this curriculum.

FOREST ENGINEERING CURRICULUM

First Semester	Credit Hours	Second Semester	Credit Hours
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Freshman Year

F Bot 100	General Botany	4	F Zool 100	General Zoology . .	4
Chem 106	General Chemistry . .	3	Chem 116	General Chemistry .	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
*Engl 101	Freshman English . .	3	Engl 102	Freshman English .	3
*Math or Elective		3	*Math or Elective		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
17			17		

Sophomore Year

*Math or Elective	3	*Math or Elective	3			
Graph 280	Technical Drawing .	3	A Math 360	Introduction to		
F Econ 301	Introduction to			Computer		
	Micro-Economics .	3		Programming . . .	3	
Phys 103	General Physics	4	F Econ 300	Introduction to		
MEE 225	Engineering			Macro-Economics	3	
	Mechanics	4	Phys 104	General Physics . . .	4	
Elective		3	MEE 226	Engineering		
				Mechanics	3	
		18				16

Junior Year

F Engr 310	Forest Engineering		F Engr 301	Plane and Geodetic	
	Problems	3		Surveying	3
F Bot 210	Dendrology I	2	F Engr 340	Hydrology	3
A Math 591	Introduction to		F Engr 563	Photogrammetry . .	3
	Probability and		Silvi 324	General Silviculture	3
	Statistics	3	CIE 325	Mechanics of	
Math 585	Higher Mathematics			Deformable Bodies	3
	for Engineers and		Elective		3
	Scientists I	3			
CIE 327	Principles of Fluid				
	Mechanics	4			
**Engineering Science Elective		3			
18			18		

Senior Year

F Engr 410	Structures	4	F Engr 510	Transportation	
F Engr 412	Principles of Produc-			Systems	3
	tion (Harvesting) .	3	***F Engr 540	Hydrologic Controls	3
F Mgt 530	Forest Management .	4	F Engr 599	Forest Engineering	
CIE 437	Soil Mechanics and			Planning	4
	Foundations I	3	Electives		6
Elective		2-3			
16-17			16		

Optional Senior Year—Photogrammetry & Geodetic Engineering Emphasis

F Engr 502	Terrestrial Geodesy .	3	F Engr 566	Remote Sensor	
F Engr 560	Theory of Errors and			Interpretation . .	3
	Adjustments	3	F Engr 599	Forest Engineering	
F Engr 564	Photogrammetry II .	3		Planning	4
A Math 560	Information Proces-		****F Engr 503	Astro-Geodesy . . .	3
	sing Fundamentals .	3	Electives		6
F Mgt 530	Forest Management .	4			
16			16		

Paper Science and Engineering

Two options are offered in this curriculum—one providing a broad education in the paper sciences, and the other a similar course of study but with more emphasis on chemical engineering.

Students planning to enter as juniors must have a total of 66 credits or an Associate degree and acceptable transfer credits of 66 credits. These credits shall include the following core courses:

English	6 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
General Physics	8 credits
*Mathematics	9 credits
**Economics	6 credits
Electives	As required

Students will be required to complete the regular program for the junior and senior years as listed on pages 55 and 57. In order to graduate in two years, students must have completed the core courses specified above prior to the junior year.

If a student desires to take more than two years to complete his Bachelor of Science degree program, deficiencies in the core courses may be completed during the regular academic year. Credit hours for core courses taken in addition to the Associate degree cannot be substituted for credit hours in either the junior or senior year. If a student has taken a course during the first two years that is considered equivalent to any of the required courses in the final two-year program at the College of Environmental Science and Forestry, substitution of other appropriate courses can be made, but the total credit hours required for graduation will *not* be reduced.

PAPER SCIENCE OPTION

This program provides basic training in the physical sciences, mathematics, and engineering, combined with a specific understanding of the chemistry and anatomy of wood, pulping of wood, chemistry and physics of paper and paper formation, and the chemical engineering of pulp and paper processing. The option permits the student a range of elective courses with a choice between the sciences or management.

*Paper Science Option students need analytical geometry, differential and integral calculus; Paper Engineering Option students need 3 additional credits in an advanced mathematics course beyond integral calculus.

**Desirable but not necessary for the Engineering-Science graduates.

PAPER SCIENCE & ENGINEERING CURRICULUM

PAPER SCIENCE OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry ...	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry ...	3
Engl 101	Freshman English	3	Chem 117	General Chemistry Lab	1
*Math		3	Engl 102	Freshman English	3
Elective		3	*Math		3
Phys Ed or ROTC		0	Elective		3
GF 032	Orientation	0	Phys Ed or ROTC		0
		17			16

Sophomore Year					
*Math or Elective		3	*Math or Elective		3
F Chem 221	Organic Chemistry I ..	3	F Chem 223	Organic Chemistry II .	3
F Chem 222	Organic Chemistry		F Chem 224	Organic Chemistry	
	Lab I	1		Lab II	1
Phys 103	General Physics	4	Engl 211	Technical Writing ...	3
Acct 251	Elementary Accounting	3	Phys 104	General Physics	4
F Econ 301	Introduction to Micro-		Elective		3
	Economics	3			
		17			17

Junior Year					
F Chem 575	Wood Chemistry I ...	2	Graph 181	Graphics I	2
F Chem 576	Wood Chemistry II ..	2	Chem 332	Quantitative Analysis .	2
Chem 346	Physical Chemistry ...	3	Chem 333	Quantitative Analysis	
Chem 347	Physical Chemistry Lab	1		Lab	1
PSE 300	Introduction to the		Chem 356	Physical Chemistry ...	3
	Pulp & Paper		Chem 357	Physical Chemistry Lab	1
	Industry	1	PSE 301	Pulp and Paper	
WPE 487	Wood Structure &			Processes	3
	Properties	4	PSE 302	Paper Processes Lab ..	1
Elective		3	PSE 570	Principles of Mass and	
				Energy Balance	3
		16			16

SUMMER MILL EXPERIENCE: PSE 304—Mill Experience—5 credit hours. Twelve weeks' full-time pulp or paper mill employment approved by the Department between the junior and senior years.

Senior Year					
PSE 561	Pulping Technology ..	4	PSE 496	Special Topics	1
PSE 565	Paper Properties	5	PSE 556	Economics of Pulp &	
PSE 572	Pulp & Paper Unit			Paper	3
	Operations Lab I ..	1	PSE 566	Paper Coating	3
PSE 575	Unit Operations I: Fluid		PSE 568	Papermaking Processes	3
	Mechanics & Heat		PSE 578	Unit Operations III:	
	Transfer	3		Mass Transfer	3
PSE 576	Unit Operations II:		PSE 579	Unit Operations IV:	
	Process Control and			Recovery Processes	
	Mass Transfer	2		Operations	2
		15			15

1. *Mathematics through Math 227 or the equivalent is required; it is recommended that students in this option also complete Math 328.

2. A total of 134 credit hours is required in this option.

PAPER ENGINEERING OPTION

A student may earn a chemical engineering degree in one year following the completion of this option. This program is designed to provide a basic education in the physical sciences and mathematics, with emphasis on chemical engineering. Courses include fundamental studies in wood chemistry, wood anatomy, pulping, and the chemistry and physics of paper and paper formation.



PAPER SCIENCE & ENGINEERING CURRICULUM

PAPER ENGINEERING OPTION

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry ...	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry ...	3
Engl 101	Freshman English	3	Chem 117	General Chemistry Lab	1
*Math.....		3	Engl 102	Freshman English	3
Elective		3	*Math.....		3
Phys Ed or ROTC		0	Elective		3
GF 032	Orientation	0	Phys Ed or ROTC		0
		17			16

Sophomore Year					
Math or Elective		3	*Math or Elective		3
F Chem 221	Organic Chemistry I ..	3	F Chem 223	Organic Chemistry II .	3
F Chem 222	Organic Chemistry		F Chem 224	Organic Chemistry	
	Lab I	1		Lab II	1
Phys 103	General Physics	4	Phys 104	General Physics	4
Acct 251	Elementary Accounting	3	Engl 211	Technical Writing	3
F Econ 301	Introduction to Micro-		Elective		3
	Economics	3			17
		17			17

Junior Year					
F Chem 575	Wood Chemistry I ...	2	Graph 181	Graphics I	2
F Chem 576	Wood Chemistry II ..	2	Chem 332	Quantitative Analysis .	2
Chem 346	Physical Chemistry ...	3	Chem 333	Quantitative Analysis	
Chem 347	Physical Chemistry Lab	1		Lab	1
PSE 300	Introduction to the Pulp		Chem 356	Physical Chemistry ...	3
	and Paper Industry .	1	Chem 357	Physical Chemistry Lab	1
WPE 487	Wood Structure &		PSE 301	Pulp and Paper	
	Properties	4		Processes	3
Elective		3	PSE 302	Paper Processes Lab ..	1
		16	PSE 570	Principles of Mass and	
				Energy Balance	3
					16

SUMMER MILL EXPERIENCE: PSE 304—Mill Experience—5 credit hours. Twelve weeks' full-time pulp or paper mill employment approved by the Department between the junior and senior years.

Senior Year					
PSE 561	Pulping Technology ..	4	PSE 496	Special Topics	1
PSE 565	Paper Properties	5	PSE 566	Paper Coating	3
PSE 572	Pulp & Paper Unit ...		PSE 568	Papermaking Processes	3
	Operations Lab I ..	1	PSE 574	Pulp & Paper Unit ...	
PSE 575	Unit Operations I:			Operations Lab II .	3
	Fluid Mechanics &		PSE 578	Unit Operations III:	
	Heat Transfer	3		Mass Transfer	3
PSE 576	Unit Operations II:		PSE 579	Unit Operations IV:	
	Process Control and			Recovery Processes	
	Mass Transfer	2		Operations	2
		15			15

- *Mathematics through Math 328, or the equivalent is required; it is recommended that students in this option also complete Math 585.
- A total of 134 credit hours is required in this option.

Wood Products Engineering

Four options are available in this curriculum: Building Construction, Materials Marketing, Production Systems Engineering, and Wood Science. The objective of the curriculum is to prepare students to enter the various segments of the wood products industry.

Students may enter this curriculum either as freshmen or as transfers from other colleges or universities. Students with Associate degrees may enter with full junior standing if certain subject matter requirements are met. These requirements are different for the various options and are specified in detail under the option descriptions below. Students considering transfer into the Wood Products Engineering Department are urged to consult with College Admissions personnel for detailed guidance concerning option requirements.

WOOD SCIENCE OPTION

This option provides an opportunity for students to obtain the necessary scientific background for research and development in wood-related industries, or for graduate study leading to fundamental research and/or college teaching.

Because of the breadth of wood science, and in order to accommodate the particular needs or interests of students, two areas of emphasis are provided within the option. Those students primarily interested in the biological approach in studying wood, and in its development in the living tree, will concentrate in the anatomical or biophysical aspects of wood science. Those interested particularly in physical wood science will emphasize the basic physical sciences. In either case, at least nine credit hours of elective courses should be taken in the humanities and social sciences.

Transfer students with an Associate degree or its equivalent may enter with full junior standing if their previous course work includes one year each of general chemistry, organic chemistry, and physics, plus mathematics through topics in calculus. Any deficiencies in botany or zoology may be fulfilled later.

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1. *It is recommended that at least 9 credit hours of these electives be in the social sciences or humanities.
 2. A total of 133 credit hours is required in this option.

WOOD PRODUCTS ENGINEERING CURRICULUM

WOOD SCIENCE OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Chem 106	General Chemistry	3	Chem 116	General Chemistry ...	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
Engl 101	Freshman English	3	Engl 102	Freshman English	3
Math 125	Elementary Analytic Geometry	3	Math 226	Differential Calculus .	3
Elective		3	Graph 181	Graphics I	2
Phys Ed or ROTC		3	Phys Ed or ROTC		0
G F 032	Orientation	0			
		17			16

Sophomore Year

F Chem 221	Organic Chemistry I .	3	F Chem 223	Organic Chemistry II .	3
F Chem 222	Organic Chemistry Lab I	1	F Chem 224	Organic Chemistry Lab II	1
Engl 210	Advanced Composition and Literature	3	Engl 211	Technical Writing	3
Math 227	Integral Calculus	3	Math 328	Topics in Calculus ...	3
Phys 103	General Physics	4	Phys 104	General Physics	4
*Elective		3	F Econ 290	Introduction to Economics for Forestry .	3
		17			17

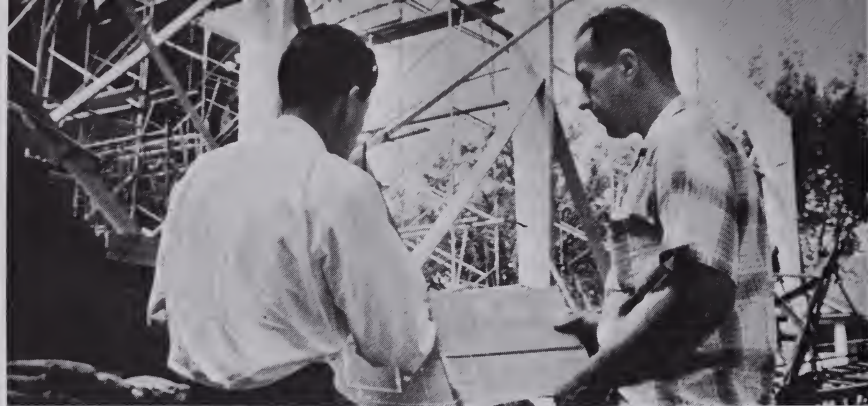
Junior Year

Chem 346	Physical Chemistry ...	3	Chem 356	Physical Chemistry ...	3
WPE 322	Mechanical Processing	3	WPE 526	Fluid Treatments	3
F Bot 210	Dendrology I	2	WPE 520	Polymeric Adhesives and Coatings	3
A Math 591	Introduction to Probability and Statistics	3	*Electives		6
Wood Anatomy Sub-option:					
F Biol 330	Principles of General Physiology	3			
or					
Wood Physics Sub-option:					
A Math 360	Introduction to Computer Programming	4			
WPE 487	Wood Structure & Properties	4			
		18			15

WPE 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

Senior Year

WPE 522	Composite Materials ..	3	WPE 502	Timber Mechanics ...	4
Wood Anatomy Sub-option:			WPE 498	Research or Design Problem	3
WPE 585	Microtechnique and Photomicrography	(3)	Wood Anatomy Sub-option:		
Phys 261	Introduction to Modern Physics (3)	6-7	WPE 588	Commercial Timbers of the World ..(3)	
Wood Physics Sub-option:			F Bot 585	Plant Anatomy ..(3)	
MEE 225	Engineering Mechanics ....(4)		Wood Physics Sub-option:		
F Chem 556	Polymer Properties (3)		MEE 226	Engineering Mechanics ....(3)	6
WPE 566	Wood-Water Relationships	3	F Chem 520	Nuclear Chemical Techniques ... (3)	
*Electives		2-3	*Elective		3
		15			16



BUILDING CONSTRUCTION OPTION

The current pressures for new housing and urban reconstruction have led to an option that develops a deep awareness of the effects of construction on the environment, as well as the efficient use of materials, particularly wood. There is an increasing demand for technically trained specialists in the construction industry and supporting fields who have the skills to use efficiently the wide variety of wood-based building materials, with consideration to their place in respect to other materials and to the purpose of the end product.

Transfers with A.A.S. degrees in Civil-Construction Technology will be accepted.* They are required to have at least one semester each of chemistry and physics and recommended to have calculus and engineering mechanics. Calculus and engineering mechanics may be taken after transfer with some sacrifice of elective courses and the possibility of delayed graduation.

Transfers from other areas of study will require special program adjustments on an individual basis by the department.

The specialty electives are designed to allow the opportunity for concentration areas related to the individual's career objectives. It is felt that the wide range of construction activities found in practice cannot be adequately serviced by a rigid program of study. This factor, along with student concern in having curriculum participation, indicates the need for a flexible program.

Suggested areas and available courses have been grouped below. Many courses are not mentioned, but most relevant material should be under the following areas:

<i>Engineering</i>	<i>Management</i>	<i>Environment</i>
Structural Analysis	Marketing	Urban Planning
Metallurgy	Business Law	Sanitary Engineering
Adv. Soil Mechanics	Accounting	Waste Water Treatment
Photogrammetry	Finance	Environmental Sanitation
Heat Transfer	Industrial Management	Land Use
Transportation	Operations Research	Landscape Architecture
Systems Analysis	Human Factors	General Ecology

*With full junior standing.

WOOD PRODUCTS ENGINEERING CURRICULUM BUILDING CONSTRUCTION OPTION

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to	
Chem 106	General Chemistry ..	3		Macro-Economics .	3
Chem 107	General Chemistry		Chem 116	General Chemistry ..	3
	Lab	1	Chem 117	General Chemistry	
Engl 101	Freshman English ...	3		Lab	1
Math 125	Elementary Analytic		Engl 102	Freshman English ...	3
	Geometry	3	Math 226	Differential Calculus .	3
*Elective		3	Graph 181	Graphics I	2
Phys Ed or ROTC		0	Phys Ed or ROTC		0
G F 032	Orientation	0			
		17			15

Sophomore Year

MEE 225	Engineering		F Engr 301	Plane and Geodetic	
	Mechanics	4		Surveying	3
F Econ 301	Introduction to Micro-		E I 113	Introduction to Envir-	
	Economics	3		onmental Studies .	3
Math 227	Integral Calculus ...	3	Phys 104	General Physics	4
Phys 103	General Physics	4	Geol 101	General Geology	3
*Elective		3	*Elective		3
		17			16

Junior Year

WPE 322	Mechanical Processing	3	WPE 502	Timber Mechanics ..	4
WPE 487	Wood Structure and		WPE 520	Polymeric Adhesives &	
	Properties	4		Coatings	3
A Math 360	Introduction to Com-		F Engr 342	Hydraulics in	
	puter Programming	3		Construction	4
Acct 251	Elementary		CIE 326	Engineering Materials	3
	Accounting	3	*Elective		3
**Specialty Elective		3			
		16			17

WPE 390--Field Trip--2 credit hours. A two-week field trip at the end of the junior year.

Senior Year

WPE 522	Composite Materials .	3	WPE 544	Materials Marketing .	3
F Engr 410	Structures	4	WPE 550	Construction Equip-	
F Engr 531	Soil Mechanics for			ment	3
	Engineers	3	WPE 554	Construction Manage-	
Specialty Elective		3		ment	3
*Elective		3	*Elective		3
			**Specialty Elective		3
		16			15

1. *It is recommended that students elect at least 12 credit hours from the social sciences or the humanities.
2. **Refer to College Catalog for listings of possible areas.
3. A total of 131 credit hours is required in this option.

PRODUCTION SYSTEMS ENGINEERING OPTION

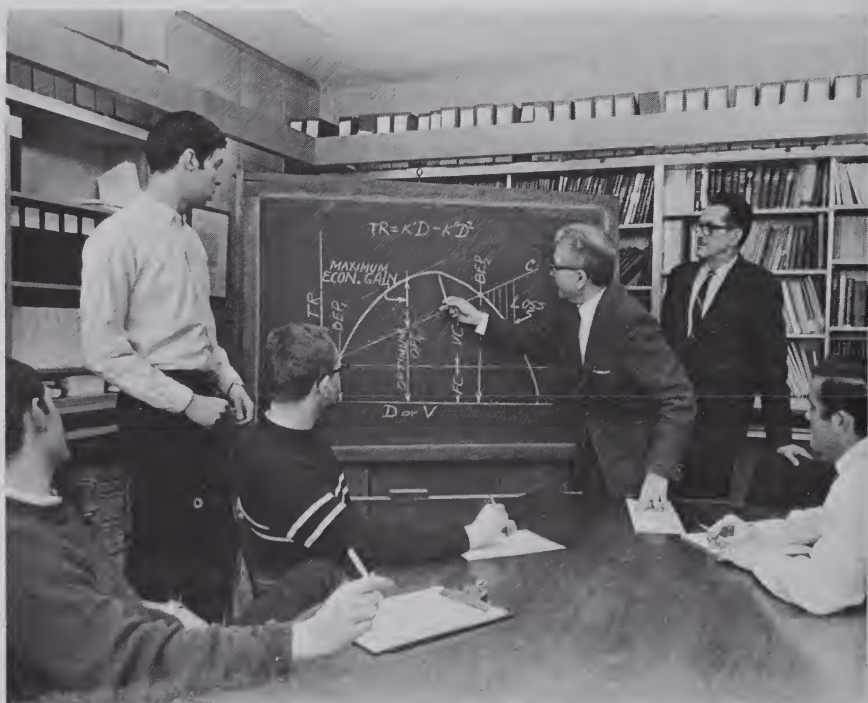
The goal of this option is to provide an education in the areas of process development, plant design, and production management of modern industries utilizing wood, its plastic and other composites, and related raw materials.

The program establishes a solid foundation in basic sciences and in applied mathematics, including computer programming and engineering statistics. On this is built a sequence of studies in engineering and management sciences essential to planning and development of production processes, and to design and operation of modern manufacturing facilities.

Modern production plants are complex systems of machines, men, money, and management, integrated for production in highly competitive markets. The graduates of this option must be familiar with planning, design, operation, and the economics of entire systems.

Transfer students with an Associate degree or its equivalent may enter with full junior standing if their previous course work includes one year each of chemistry and physics, plus mathematics through topics in calculus.

Production Engineering students may arrange with their advisors to prepare for special course options leading to admission into a Bachelor of Science degree program at Syracuse University in either Industrial or Mechanical Engineering.



WOOD PRODUCTS ENGINEERING CURRICULUM PRODUCTION SYSTEMS ENGINEERING OPTION

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry ...	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry ...	3
Engl 101	Freshman English	3	Chem 117	General Chemistry Lab	1
Math 125	Elementary Analytic		Engl 102	Freshman English	3
	Geometry	3	Math 226	Differential Calculus ..	3
*Elective		3	Graph 181	Graphics I	2
Phys Ed or ROTC		0	Phys Ed or ROTC		0
G F 032	Orientation	0			
		17			15

Sophomore Year					
F Econ 301	Introduction to Micro-		A Math 360	Introduction to Com-	
	Economics	3		puter Programming .	3
Engl 210	Advanced Composition		Engl 211	Technical Writing	3
	and Literature	3	Math 328	Topics in Calculus ...	3
Math 227	Integral Calculus	3	Phys 104	General Physics	4
Phys 103	General Physics	4	*Elective		3
*Elective		3			
		16			16

Junior Year					
WPE 322	Mechanical Processing	3	F Mgt 561	Operation Cost Control	3
WPE 487	Wood Structure and		WPE 502	Timber Mechanics ...	4
	Properties	4	WPE 520	Polymeric Adhesives	
INE 548	Engineering Economic			and Coatings	3
	Analysis	3	WPE 526	Fluid Treatments	3
A Math 591	Introduction to Prob-		MEE 351	Fundamentals of	
	ability and Statistics	3		Thermodynamics I .	3
MEE 225	Engineering Mechanics	4			
		17			16

WPE 390—Field Trip—2 credit hours. A two-week field trip at the end of the junior year.

SUMMER EXPERIENCE: 2 months' experience in an approved wood products or allied firm or laboratory is required. A written report, to be presented in WPE 497, is required. Usually fulfilled between the junior and senior years.

Senior Year					
ELE 221	Electrical Science I ...	3	ELE 222	Electrical Science II ..	3
INE 575	Industrial Methods and			Research or Design	
	Systems Engineering	3	WPE 498	Problem	3
WPE 570	Production Systems I:		WPE 572	Production Systems II:	
	Analysis	3		Synthesis	3
WPE 522	Composite Materials ..	3	*Electives		6
WPE 497	Senior Seminar for				
	Wood Products				
	Engineering Majors .	2			
Tech. Elective		3			
		17			15

- *It is recommended that students elect at least 9 credit hours from the social sciences or the humanities.
- A total of 131 credit hours is required for graduation.

MATERIALS MARKETING OPTION

The marketing of wood products, with their related materials and services, brings together the essential elements of production, distribution, and consumption of our major renewable material resource. Preparation for successful marketing involves development of basic knowledge of the materials and their properties, their efficient processing and fabrication, and the effective use of their products. Because marketing channels vary widely in nature, size, and complexity to meet the equally varied needs of commercial, industrial, and consumer markets, preparation must also include the sound general business orientation required of any segment of the economy.

This option is designed to educate students for professional careers in technical sales and management of distributive enterprise in the wood products and allied industries.

Transfers with A.A.S. degrees in Civil-Construction Technology will be accepted.* They are required to have at least one semester each of chemistry and physics and recommended to have one semester each of accounting and economics. Accounting and economics may be taken after transfer with some sacrifice of elective courses and the possibility of delayed graduation.

*With full junior standing



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1. **Mathematics requirements include analytic geometry and statistics. College algebra and trigonometry may be taken in the freshman year prior to completion of these mathematics requirements in the sophomore year.
 2. ***Electives are to be from the humanities or the social sciences.
 3. A total of 131 credit hours is required in this option.

WOOD PRODUCTS ENGINEERING CURRICULUM

MATERIALS MARKETING OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
* F Bot 100	General Botany ...	4	Pub Add 215	Public Speaking ...	3
Chem 106	General Chemistry .	3	Chem 116	General Chemistry .	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English .	3
**Math 015			**Math 016 or	Elective	3
***Elective		3	***Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
G F 032	Orientation	0			
		17			16

Sophomore Year					
Acct 251	Elementary Accounting	3	Acct 252	Elementary Accounting	3
Engl 210	Advanced Composition and Literature	3	Engl 211	Technical Writing .	3
			**A Math 571 or	Elective	3
**Math 125 or	Elective	3	Phys 104	General Physics ...	4
Phys 103	General Physics ...	4	F Econ 290	Introduction to Economics for Forestry	3
***Elective		3			
Graph 280	Technical Drawing .	1			
		17			16

Junior Year					
WPE 322	Mechanical Processing	3	FIN 355	Money and Banking	3
A Math 360	Introduction to Computer Programming ...	3	WPE 520	Polymeric Adhesives and Coatings ...	3
Mktg 355	Marketing Principles, Methods, and Problems	3	WPE 526	Fluid Treatments ..	3
			Mktg 356	Distribution Management ...	3
WPE 487	Wood Structure and Properties	4	***Elective		3
***Elective		3			
		16			15

WPE 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

SUMMER EXPERIENCE: 2 months' experience in an approved wood products or allied firm or laboratory is required. A written report, to be presented in WPE 497, is required; usually fulfilled between the junior and senior years.

Senior Year					
WPE 522	Composite Materials	3	WPE 544	Materials Marketing	3
WPE 497	Senior Seminar for Wood Products Engineering Majors	2	F Econ 520	Economics for Wood-Using Industries .	3
WPE 442	Light Construction .	3	Bus Law 357	The Law of Contracts	3
WPE 402	Elementary Timber Mechanics	3	FIN 356	Corporation Finance	3
Bus Law 355	Basic Concepts and Applications	3	***Elective		3
***Elective		3			
		17			15

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE MANAGEMENT

The School of Environmental and Resource Management offers a curriculum in Resources Management. This program prepares students for professional forestry positions.

Resources Management

This curriculum is currently in process of revision to reflect the new organizational and environmental thrust of the College. The new curriculum, which is scheduled for implementation in academic year 1972-73, retains essentially the same objectives but is designed to provide better integration of subject matter.

This is the central, accredited forestry educational program of the College. The objectives of this curriculum are (1) to provide a general and well-integrated education for professional practice as foresters and land managers, and (2) to open a broad array of natural resource-related and environmental management opportunities for the individual student to pursue his own interests and abilities in particular endeavors or through advanced study.

The core of required courses presents the principles and practices basic to sound management of extensive nonurban land areas for their many values in producing timber, wildlife, water, aesthetic and recreational uses. Over a third of our nation's area is forest land. The relationships of these valuable resources to modern society's needs and to the quality of our living environment are critical and increasing in importance. The core assures fulfillment of education requirements for all initial professional positions in Federal and state forestry, as well as the normal requirements of industrial and private enterprises in land management. Extensive elective courses serve to broaden the student's general education, to strengthen his perceptions and integration of knowledge, or to provide a solid base for those planning graduate study in resources management or its specialties.

The curriculum offers broad opportunity and maximum credit for students interested in transferring from liberal arts or science programs in community colleges or other universities.

Recommended program of courses for students planning to transfer as entering juniors totals 64 credits or an Associate degree and include:

*Physical and Biological Sciences	12-16 credits
*Mathematics	3-9 credits
*Social Sciences and Humanities	15-23 credits
Electives	19-23 credits

Attendance at a 5-week Summer Session course in Field Forestry at the Pack Demonstration Forest, Warrensburg, New York, is required.

*Total credits in these areas should be 45.

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1. *Six credit hours of mathematics are required. Two semesters of calculus are highly recommended to be taken prior to the junior year, particularly for students interested in graduate work.
 2. **At least one of the following two courses must be chosen from these electives: Silvi 351: Meteorology and Fire Behavior, F Zool 552: Wildlife Ecology.
 3. Three elective courses (totaling 9 credits) must be selected from forestry and allied subject areas.

RESOURCES MANAGEMENT CURRICULUM

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Chem 106	General Chemistry	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
Engl 101	Freshman English	3	Engl 102	Freshman English	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
G F 032	Orientation	0			
		17			17

Sophomore Year

F Bot 210	Dendrology I	2	F Econ 300	Introduction to Macro-Economics	3
Graph 280	Technical Drawing	1	Geol 101	General Geology	3
F Mgt 201	Plane Surveying	3	Phys 104	General Physics	4
Phys 103	General Physics	4	Elective		3
Elective		3	Elective		3
Elective		3			
		16			16

SUMMER SESSION IN FIELD FORESTRY—5 weeks, 6 credit hours: Required of all students following the sophomore year and prior to registration for the junior year (including junior year transfer students who elect this curriculum).

F Biol 301	Field Biology	1
F Mgt 303	Introduction to Forest Measurements	1
Silvi 302	Silvics	1
Res Mgt 304	Silviculture-Resource Management	3
		6

Junior Year

A Math 571	Introduction to Statistical Analysis	3	F Mgt 522	Mensuration	3
or			F Ento 300	Principles of Forest Entomology	2
A Math 591	Introduction to Probability and Statistics		F Mgt 340	Harvesting	2
F Bot 330	Plant Physiology	2	Silvi 521	Principles of Silviculture	3
F Econ 301	Introduction to Micro-Economics	3	WPE 486	Elementary Wood Technology	2
Silvi 332	Soils	3	Elective		3
Elective		3			
Elective		3			
		17			15

Senior Year

F Econ 510	Principles of Forestry Economics	3	F Mgt 572	Principles of Outdoor Recreation	3
F Mgt 554	Forest Administration and Policy	3	Silvo 540	Forest Hydrology	
Silvi 524	Practices of Silviculture	3	F Mgt 552	Management Planning and Operations	3
WPE 304	Introduction to Forest Products	2	Res Mgt 502	Resources Management (or Other Forestry Elective)	3
**Electives		6	**Electives		6
		17			15

- Three elective courses (totaling 9 credits) must be selected from the humanities and social science areas with at least one course from each area.
- Additional electives should be chosen from the humanities and social science areas or from natural and physical sciences not directly related to the student's course of study.
- A total of 136 credit hours is required in this curriculum.



THE SCHOOL OF LANDSCAPE ARCHITECTURE

The School of Landscape Architecture offers two curricula in environmental design—a four-year program in Environmental Studies and a five-year professional program in Landscape Architecture.

Landscape Architecture

Professional education in the design professions today is witness to a great deal of concern for school objectives, programs, and organization. The central issue relates to the force and pace of change that characterizes the work of the environment designer and brings him into ever new challenging situations. The condition of our cities, depletion of natural resources, and pollution of our air and water all pose severe and complex threats to our society. Concurrently, a greater awareness and desire for environmental quality tax the resources and ingenuity of those in the design professions.

Several trends have emerged in recent years that suggest conditions for present and future educational programs. It is clear that an interdisciplinary approach to environmental problems is indicated and includes landscape architecture, architecture, engineering, and planning, with specific attention to the biological and behavioral sciences. It is also clear that the educational purpose must relate more directly to the health and well-being of man and be designed for versatility rather than the narrow concerns of career orientation. Finally, that contemporary education should orient the student to systems thinking in his approach to knowledge, society, and the individual.

In an effort to recognize and respond to the demands and responsibilities of our times, the following curriculum is offered in environmental studies and landscape architecture. The major characteristics of the program are:

1. An expansive frame of reference for landscape architects as major contributors to the solution of environmental problems, with a concurrent broad educational base for their professional training.
2. Provision for flexibility to accommodate shifts in educational goals, particularly within the design professions.
3. Articulation with the programs of the two-year colleges to permit ready transfer to professional programs.
4. Professional training to more adequately meet the educational standards

of accrediting bodies, the American Society of Landscape Architects and the Division of Professional Education of the New York State Education Department.

The curriculum is based on three consecutive educational sequences:

- 1. The first two years may be taken at this college or at any other school or college. Students may transfer into the freshman, sophomore, or junior programs, depending upon acceptable transfer credit.

Requirements for students planning to transfer as entering juniors are as follows: (a) Associate degree or acceptable transfer credit totaling a minimum of 60 semester credit hours or their equivalent; (b) biology, 3 credits, and technical drawing, 3 credits; and (c) the equivalent of college algebra and trigonometry plus high school chemistry or physics.

A recommended course series prior to transfer would include:

English (Composition)	4 credits
English (Literature)	6 credits
Speech	3 credits
Biological Sciences	6 credits
Social Sciences	9 credits
Art Media	2 credits
Geology	3 credits
Geography	3 credits
Humanities	6 credits
Technical Drawing	3 credits
Surveying	3 credits

This series is strongly recommended but not required. Deficiencies in these areas will be accommodated as possible during subsequent semesters and summer school sessions.

- 2. The third and fourth years are devoted to a broad spectrum of courses dealing with a variety of aspects of environment and man's relationship to it, synthesized through development of ability in both the functional and creative design processes. The successful completion of this 127-hour program qualifies the student to receive a Bachelor of Science degree with a major in Environmental Studies. The education is broad but with sufficient training to focus the student's concerns for the physical environment and its significance. At this point, students may enter the field for a trial experience in professional practice, may pursue graduate study, or may apply to continue study toward the first professional landscape architectural degree.
- 3. The fifth year is comprised of three major components beginning with a short summer session course in plant materials. The fall semester is devoted to a unique program of off-campus study coupled with a concentration of professional course work in the final semester. The off-campus experiential studio is described and conducted by small groups of students with study topics correlated with locational opportunities throughout the world. Successful completion of this 33-hour program leads to the degree of Bachelor of Landscape Architecture, the first professional degree. Study beyond this point is accommodated by our MLA program.

LANDSCAPE ARCHITECTURE CURRICULUM

First Semester		Credit Hours	Second Semester		Credit Hours
First Year					
Engl 101	Freshman English	3	Engl 102	Freshman English . . .	3
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Phil 187	Theories of Knowledge and Reality . .	3	EI 113	Introduction to Environmental Studies .	3
Graph 182	Art Media I	1	Graph 183	Art Media II	1
*Elective		3	F Econ 290	Introduction to Economics for Forestry	3
Phys Ed or ROTC		0	*Elective		3
G F 032	Orientation	0	Phys Ed or ROTC		0
		14			17
Second Year					
**English		3	**English		3
F Bot 210	Dendrology I	2	Phil 251	Logic	3
F Mgt 201	Plane Surveying	3	Graph 281	Landscape Architectural Drafting .	3
Graph 284	Art Media III	1	EI 211	General Geography . .	3
Psych 205	Foundations of Human Behavior	3	SOC 201	Introductory Sociology	3
*Elective		3	Graph 285	Art Media IV	1
		15			16
Third Year					
LA 324	Introduction to Landscape Architecture .	3	LA 325	Landscape Design Studio I	2
Graph 382	Graphics	2	Graph 383	Graphics	2
F Biol 320	General Ecology	3	LA 343	Structural Materials and Elements	3
LA 322	Basic Design	2	LA 345	Elements of Site Engineering	3
Elective		3	A Math 360	Introduction to Computer Programming	3
Elective		2	EI 311	Principles of Land Use	3
		15			16
Fourth Year (See Note 3)					
LA 420	Landscape Design Theory I	2	LA 254	Orientation for Experiential Studio	3
LA 422	Landscape Design Studio II	4	LA 423	Landscape Design Studio III	4
+LA 430	Plant Materials Culture	3	EI 471	History of Landscape Architecture	3
+LA 440	Site Development Systems	3	ARC 294	Introduction to Architecture	3
+EI 470	Art History	3	Elective		3
EI 550	Fundamentals of City & Regional Planning	3			
		18			16



OFF-CAMPUS PROGRAM

Fifth Year

LA 524	Experiential Studio ...	16	LA 522	Landscape Design	}	4
			or	Studio IV		
			LA 525	Landscape Design		
			or	Studio V		
			LA 527	Landscape Design	}	4
				Studio V		
			LA 545	Professional Practice		
				Studio II		2
			LA 547	Principles of Profes-		
				sional Practice ...		2
			LA 562	Architecture		3
			Elective			3
<hr/>			<hr/>			
16			14			

1. *All students must have completed the equivalent of college algebra and trigonometry plus high school chemistry or physics before entering third year.
2. **Based on individual preference and performance in first year course work; second year English courses will be determined in consultation with advisor.
3. At the beginning of the 4th year, students will state their degree intentions at Registration; applications for the Bachelor of Landscape Architecture program will be accepted during Spring Registration. Approval of the School of Landscape Architecture Faculty is necessary for admission to the Bachelor of Landscape Architecture program. Students in the terminal B.S. program may elect to take LA 524 (16 Hrs.) in place of the courses listed for the 8th semester. These students will substitute LA 598 (3 Hrs.) for one of the courses marked +.
4. Upon successful completion of the 4th year, the B.S. degree in Environmental Studies will be awarded. A total of 127 credit hours is required for this degree.
5. Upon successful completion of the 5th year, the Bachelor of Landscape Architecture degree will be awarded. A total of 160 credit hours is required for this degree.

CONCENTRATION IN ENVIRONMENTAL STUDIES

The College of Environmental Science and Forestry has historically provided educational programs focusing on the scientific, managerial, engineering, and design skills basic to the solution of environmental problems. The Concentration in Environmental Studies is designed (1) to provide the specialist trained in these areas with an introduction to and appreciation of the nature of man and of his institutions and their profound effect on any solution proposed for an environmental problem, and (2) to allow students in diverse areas of specialization to work together on real environmental problems in such a manner that they learn to appreciate the multifaceted nature of these problems and to work comfortably and knowledgeably with persons of diverse subject matter background.

Students electing this concentration will take a two-course sequence designed to establish an environmental awareness early in their undergraduate careers. The first of these courses—Environmental Studies 100: Introduction to Environmental Studies—will explore the cultural, socio-economic, and political factors that condition mankind's view of the environment. The second course—Environmental Studies 101: Human Ecology—will build upon the student's awareness of human values and their importance in environmental study. Students will analyze the components, first of simple and then of progressively more complex ecosystems, study the interaction of these components via the flow of energy and natural nutrient cycles, goods, and services in qualitative and simple quantitative terms, and finally, impose and evaluate the influence of man's attitudes and value systems on these ecosystems. Subsequently, as the student's disciplinary competence develops, he will elect at least two seminars (Environmental Studies 497), and two hours of problems courses (Environmental Studies 498). These are designed to provide students of diverse backgrounds to bring their special skills to focus and to work together on problems of environmental importance.

In addition to the courses listed above, and the course requirements of the diverse curricula of the College, there are a wide diversity of additional courses available for election of students interested in environmental studies, provided elective hours are available. Members of the Undergraduate Environmental Studies Advisory Group are available to discuss these with the students.

This program will educate a person to both a disciplinary specialization and a keen appreciation of how this specialization can be applied in the environmental decade of the "70's."

FOREST TECHNICIAN TRAINING

The Wanakena Campus and Program

The two-year curriculum trains students to be forest technicians. The degree of Associate in Applied Science in Forest Technology (A.A.S.) is awarded upon the successful completion of the curriculum. Practical and field phases of the program in the second year are taken at the Ranger School on the Wanakena Campus. The objectives of the curriculum are to provide students with (1) a knowledge of the field practices of forestry as related to forestry managerial needs, (2) the ability to work and communicate effectively with professional and para-professional forestry personnel, (3) an understanding of the sciences and practices of forestry with some emphasis on ecological applications.

Graduates are generally classified as forest technicians or forestry aids in initial employment positions. Forestry agencies and wood-using industries employ forest technicians as an important part of their forest management teams, usually as the "men on the ground" who plan and execute the field practice of forestry.

Since this curriculum is structured as a terminal, two-year program of the para-professional level, students interested in a professional degree in forestry are advised to enroll initially in one of the previously described College four-year undergraduate programs.

The freshman year of the forest technology curriculum consists primarily of general studies' courses which may be taken on the Syracuse Campus or at other accredited community and junior colleges and agricultural and technical institutes.

The second year of the curriculum is taken at the Ranger School on the Wanakena Campus. The second-year program at the Ranger School is intensive and practical. It is presented in a varied forest environment, emphasizes field training, and emphasizes the relationships between forest technology and managerial needs.

Forest Technician training started at the Ranger School in 1912, and the program has earned a national reputation for excellence. More than 2,500 graduates, most of whom are now working in a variety of nationwide forest activities, have attended the Wanakena Campus program. One of the five schools of the College, it is located on the banks of the Oswegatchie River in the western Adirondack Mountains near the picturesque hamlet of Wanakena. It is situated approximately 65 miles northeast of Watertown, New York, and 35 miles west of Tupper Lake, New York. The School's buildings and its surrounding forest border Cranberry Lake.

The main School building consists of a central service unit with dormitory wings on either side. The central unit contains classrooms, laboratories, library, a student lounge, faculty offices, and supporting services. The wings of the main building contain additional faculty offices, the library, a kitchen, dining rooms, and 44 student rooms (2 students per room).

Faculty living quarters are nearby on the campus. Other buildings include a maintenance shop, garages, a sugar house, and storage buildings.



The close proximity of faculty offices and student quarters and the intensive field work pattern enables students to consult easily and frequently with the faculty. The School considers this traditional close student-faculty association to be of major benefit in its training program.

The second-year curriculum is developed along practical lines with emphasis on field work with 50 percent of the studies devoted to field exercises, most of which are held in the School's forest. This rolling belt of managed forest, containing both hardwood and coniferous species, covers an area some $3\frac{1}{2}$ miles long with widths varying from $\frac{6}{10}$ to $2\frac{1}{4}$ miles. On two sides the forest is bounded by State Forest Preserve Lands. The forest is also adjacent to an area of several square miles of virgin timber within the Adirondack Forest Preserve. This excellent forest backdrop for the technology program provides a most diverse laboratory for instructional purposes.

Since the Ranger School is situated within a forest environment, some applicants to the forest technology program may mistakenly believe the program is one of forest lore and wilderness survival. It is, therefore, strongly emphasized that the forest technology curriculum demands high quality academic achievement. Students cannot complete the program without concentrated and consistent study. Classes are scheduled from 8 a.m. to 12 noon six days each week, with laboratory and field exercises scheduled from 1 to 5 p.m. five days a week. The intensity of the program normally requires a minimum of seventy hours a week of evening and weekend study, daily classes, and laboratory/field exercises. Several short trips, at no additional expense to the student, are made during the year in connection with courses in logging, forest recreation, forest mensuration, and silviculture. A longer trip of eight days' duration emphasizing regional forestry practice is sponsored during the spring semester of the second year. Students must bear their proportionate share of the cost of this field trip. The trip cost to the student consists primarily of lodging and meal expenses.

Admissions Requirements

Admission requirements for entrance into the forest technology curriculum are basically the same as for the other curricula of the College of Environmental Science and Forestry. Minimum requirements are 16 Carnegie high school units as follows: English 4; history (social science) 2; science 2 (one must be chemistry or physics); mathematics 3 (including trigonometry or Math 11); and electives. Mechanical drawing and typing are strongly suggested electives.

An applicant must submit the test results of any one of the following: (1) New York State Regents Scholarship Examination, (2) College Entrance Examination Board (CEEB), Scholastic Aptitude Test (SAT), (3) American College Test (ACT).

The Director of Admissions may waive some of the above requirements under special circumstances.

In addition to the above-listed requirements, the following requirements shall be met by all applicants:

1. The applicant shall be strongly motivated toward a career as a forest technician.
2. The applicant shall be aware of and willing to accept the work requirements of this field-forestry program and its strenuous physical demands.
3. The applicant's parents (if the applicant is under 21 years of age) shall be fully aware of the field nature of the study program, its rigorous study-work regime, and supporting academic facilities.
4. A full medical examination report must be submitted.
5. Students with previous college experience or who are currently enrolled at another college may apply for transfer. Courses transferred for credit must be appropriate to the freshman year course of studies and comparable in subject matter content and level. No transfer credit will be allowed for the second year courses taken at the Wanakena Campus. Transfer applicants must submit a recent official copy of their college transcript and a list of courses they anticipate completing prior to enrollment.

Housing and Campus Life

Students taking the second year of the forest technology curriculum at the Wanakena Campus are required to live in the School's dormitories. An exception may be made for married students who may bring their families and rent their own private accommodations in the vicinity of the Wanakena Campus. Such accommodations are not plentiful. It is recommended that each married student arrange rental arrangements well in advance of registration date.

The Wanakena Campus does not maintain an infirmary, nor does it have on its staff a physician or nurse. There are three physicians and a dentist available in the immediate area as well as an excellent Community Hospital in nearby Star Lake, New York. In emergency situations, the School transports the sick or injured student to the local physician of his choice or to the hospital. Further, there is no student accident or sickness insurance plan available through the Wanakena Campus, so that it is

strongly suggested that the student consider such coverage for himself before he reports to the Wanakena Campus.

Because of the comparatively isolated location of the Wanakena Campus, a stock of books and supplies used in connection with the second year of the program is maintained on campus for sale to students.

During the first year of the program, College-enrolled students will be guided by the rules and regulations that govern their attendance at the Syracuse Campus. During the second year of the program, students will be guided by the general rules and regulations for all College students and an additional set of Wanakena Campus "house rules" that supplement the College's general rules and regulations.

Financial Aid

Financial aid is available upon acceptance to the College. Several forms of assistance such as long-term loans, grants, work opportunities, and scholarships are offered through our financial aids office. Anyone anticipating the need for some form of financial assistance should request and refer to the *Undergraduate Financial Aids Bulletin*. It is also necessary to complete and submit a *Parents' Confidential Statement* to the College Scholarship Service, Princeton, New Jersey, and file a financial aid application with the Office of Financial Aid at the Syracuse Campus.

Costs

Estimated costs of the second-year program on the Wanakena Campus are as follows:

	<i>Tuition</i>	<i>Board & Room</i>	<i>Books & Supplies</i>	<i>Fee</i>
New York Resident	\$ 650.00	Approx. \$975.00	Approx. \$250.00	\$15.00
Non-Resident	\$1075.00	Approx. \$975.00	Approx. \$250.00	\$15.00

An additional estimated expense of \$150.00 will likely be incurred to cover the cost of laundry and clothing. The cost of the 8-day regional forestry practice trip during the spring semester is estimated at approximately \$100.00. There is also a \$10.00 graduation fee and a refundable property deposit of \$15.00. Costs of the first year will vary with the specific institution attended.

Placement

The School assists in placement of graduates. The reputation of the Ranger School usually results in graduates being able to find employment readily. Employment is common with local, state, and Federal forestry and land resource agencies, private forestry enterprises, and surveying firms. Positions most frequently filled by recent graduates include: state forest ranger, state forest technician, forestry aide, industrial forest district supervisor, timber inventory specialist, timber sales supervisor, forest surveyor, forest engineering aide, forest protection technician, forest research technician, forest equipment salesman, and other similar positions.

FOREST TECHNOLOGY CURRICULUM

(Associate in Applied Science Degree)

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
(Syracuse Campus or preferably taken at a two-year college)					
***F Bot 100	General Botany	4	F Zool 100	General Zoology	4
*Engl 101	Freshman English . .	3	*Engl 102	Freshman English . .	3
**Math or Elective	.....	3	**Math or Elective	.....	3
GF 100	Forest Resources and the Environment .	3	F Econ 290	Introduction to Eco- nomics for Forestry	3
Graph 280	Technical Drawing .	1	Acct 251	Introduction to Finan- cial Accounting . .	3
Phys Ed or ROTC	.....	0	Phys Ed or ROTC	.....	0
***G F 032	Orientation	0			
		14			16

Senior Year (Wanakena Campus)

F Tech 200	Dendrology I	2	F Tech 201	Dendrology II	1/2
F Tech 202	Plane Surveying I . .	4	F Tech 203	Plane Surveying II . .	3
F Tech 204	Forest Mensuration & Statistics I	3	F Tech 205	Forest Mensuration & Statistics II	2 1/2
F Tech 206	Forest Ecology	1 1/2	F Tech 207	Aerial Photogram- metry	1 1/2
F Tech 208	Forest Installations . .	3	F Tech 209	Forest Roads	2
F Tech 210	Silviculture I	1 1/2	F Tech 211	Silviculture II	1 1/2
F Tech 212	General Forestry . .	1 1/2	F Tech 213	Forest Protection . .	2 1/2
F Tech 214	Personnel Management	1 1/2	F Tech 215	Timber Harvesting .	1 1/2
F Tech 216	Wood Technology . .	1 1/2	F Tech 217	Forest Management .	1 1/2
F Tech 218	Forest Recreation . .	1	F Tech 219	Elements of Wildlife Ecology	1 1/2
			F Tech 221	Wood Utilization . .	1
			F Tech 223	Regional Silviculture .	1
			F Tech 225	Regional Forestry Practices	1 1/2
		20 1/2			21 1/2

1. *If competency in freshman English is shown, these 6 credit hours can be used for electives. The selection of courses related to communication skills is strongly recommended.
2. **Competency in plane trigonometry and college algebra is required. When this is demonstrated, these become elective credits.
3. ***In addition to taking GF 032, students in this program are expected to complete the one week Orientation session, to be given at the Wanakena Campus prior to Fall Registration.
4. A total of 72 credit hours is required. Upon satisfactory completion, an Associate Science (A.A.S.) degree in forest technology will be awarded.



VI

SUMMER SESSIONS

A wide array of courses at the undergraduate and graduate levels is available to College of Environmental Science and Forestry students in the Syracuse University summer sessions. Research problems, thesis, and special courses regularly available at the College may be taken also during the summer sessions. Syracuse University courses taken must be an integral part of the student's planned program and be approved by his faculty advisor.

Transfer students are advised to review their special course needs with the Office of Admissions and to consider summer session attendance where completions of background courses in mathematics, chemistry, economics, or general education subjects are necessary for fall semester entry in full standing. Information on courses available on the Syracuse campus, session dates, and registration procedures is available upon request from the Office of Student Affairs or the Office of Graduate Studies at the College. Summer session tuition charges at the College of New York State residents are \$21.50 for undergraduate lower level students, \$26.75 for undergraduate upper level students, and \$40.00 for graduate level students. Tuition charges for nonresidents of New York State are correspondingly \$35.75, \$43.50, and \$50.00 per credit.

**Summer Sessions in Field Forestry
Charles Lathrop Pack Demonstration Forest
Warrensburg Campus
Warrensburg, New York**

A five-week (6-credit) program of courses emphasizing the field application of forestry principles and practices is conducted in two sessions each summer at the Pack Demonstration Forest near Warrensburg, New York. These sessions are coordinated with College and Syracuse University summer sessions, permitting students to attend an on-campus session and a field session in the same summer. The courses presented in the Field Forestry program are listed in both the Forest Biology and Resources Management curricula sections. Room, board, and fee charges approximating \$175 are levied. No tuition charge is made for matriculated students since the courses in this session are coordinated with and considered an integral part of the fall semester of the junior year. *Transfer students* planning to enroll in either the Resources Management or Forest Biology curriculum should write to the Director, Summer Session in Field Forestry at the College for additional information on session dates and special requirements.

Completion of the Field Forestry program is required of students in Resources Management prior to the fall term of their junior year. Students in Forest Biology are also required to attend either this session or the session at Cranberry Lake Biological Station, although attendance at other approved biological field stations may be arranged with the Curriculum Director.

Summer Session in Environmental Biology
Cranberry Lake Biological Station
Charles Lathrop Pack Demonstration Forest
Cranberry Lake Campus
Cranberry Lake, New York

The Summer Session in Environmental Biology provides graduate students and selected undergraduate biology majors with the opportunity to continue their studies and research at a lake-and-forest field station. The summer program is jointly sponsored by the School of Biology, Chemistry and Ecology of the State University College of Environmental Science and Forestry and the Department of Biological Sciences at the State University of New York at Albany. Qualified students from other institutions are welcome.

Cranberry Lake and its environs are ideally suited for an advanced biology summer program. The surrounding topography is rolling hill and lake country dotted with numerous small ponds, closed bogs, and stream drainages. The lake itself is the third largest body of water in the Adirondacks. Because eighty percent of the shoreline is in State ownership, the lake remains relatively unspoiled by recreational developments and is free of pollution problems. Much of the original forest cover in the region was harvested years ago; today a rich variety of community types occupy those sites as the vegetation reverts again to the natural forest condition. The remaining virgin forests also provide the student with many examples of stable forests, each type reflecting the particular environmental conditions controlling forest development. A wealth of wildlife parallels the variety of cover types over the region. The area is centrally located providing easy access to a wide range of additional ecosystems ranging from bog to alpine types.

Facilities include four classroom-laboratories; dining facilities capable of serving 150; faculty quarters and cabins; a headquarters building; 12 cabins housing 6-8 students each; a recreation hall; and several smaller, supporting buildings. Isolated across six miles of water, the Station generates its own electrical power and provides a running water and sanitation system. Telephone service is available to the outside, and mail is delivered to the Station daily. At least one boat trip a day and several on the weekends are made to the marina or village.

The eight-week program extends from late June into mid-August and is divided into two four-week sessions. Courses are taught in blocks of two-day units, permitting concentrated study without hourly interruptions. Because the Cranberry Lake Biological Station is the only field biology station in the State University system stressing graduate training, all courses are presented at a rigorous, advanced pace. College of Environmental Science and Forestry students planning to attend should be preparing for graduate study, and completion of their junior year biology sequence with a six-semester minimum cumulative average of 2.5 is recommended.

Courses in the 500-level are open both to upperclassmen and graduate students; the 700- to 900-levels are restricted to qualified graduate students.

All courses require a minimum biological background of 15 hours of biology, including at least one course in general ecology; additional prerequisites for individual courses are listed in the course descriptions.

Courses Offered Each Year

<i>Number</i>	<i>Title</i>	<i>Credits</i>	<i>Duration & Session</i>
F Biol 497	Seminar in Forest Biology	1	8 weeks I-II
F Biol 498	Research Problem in Biology . . . 1-3	4-8	weeks I-II
F Biol 515	Advanced Limnology	4	8 weeks I-II
F Bot 517	Adirondack Flora	2	4 weeks I
F Biol 521	Ecology of Freshwaters	2	4 weeks I
F Bot 522	Ecology of Forest Communities . 2	4	weeks II
F Zool 524	Vertebrate Ecology	2	4 weeks II
F Bot 527	Bryoecology	2	4 weeks I
F Bot 798	Research in Forest Botany	TBA	8 weeks I-II
F Zool 798	Research in Forest Zoology	TBA	8 weeks I-II
F Ento 798	Research in Forest Entomology . TBA	8	weeks I-II
F Bot 899	Master's Thesis	TBA	8 weeks I-II
F Zool 899	Master's Thesis	TBA	8 weeks I-II
F Ento 899	Master's Thesis	TBA	8 weeks I-II
F Bot 999	Doctoral Thesis	TBA	8 weeks I-II
F Zool 999	Doctoral Thesis	TBA	8 weeks I-II
F Ento 999	Doctoral Thesis	TBA	8 weeks I-II
F Biol 997	Biology Seminar	1	8 weeks I-II

Courses Offered Alternate Years

F Zool 523	Invertebrate Ecology	2	4 weeks I
F Zool 526	Ecology of Adirondack Fishes . 2	4	weeks II
F Ento 550	Forest & Aquatic Insects	2	4 weeks I
F Zool 575	Behavioral Ecology	2	4 weeks I
F Biol 720	Physiological Ecology	2	4 weeks II
F Biol 721	Population Dynamics	2	4 weeks II
F Biol 722	Bioclimatology	2	4 weeks II

Maximum course load is 4 credits each session or 9 credits for the two sessions.

State University tuition charges prevail at the Biology Station; Seniors pay \$26.75 a credit if State residents and \$43.50 if out-of-state; graduates from New York are charged \$40.00 and nonresidents \$50.00. Room and board charges are \$110.00 each session. A transportation fee of \$10 each session is charged for the daily boat service to and from the Station. Syracuse students register at the College of Environmental Science and Forestry through the Associate Director; all other students register through Dr. Donald McNaught, Program Director, Department of Biological Sciences, SUNY Albany, 1400 Washington Avenue, Albany, N. Y. 12203. Because facilities at the biology station are limited, applications should be received prior to May 1; late registration is accepted as space permits.



VII

GRADUATE STUDY

The stimulating interaction of faculty and students working together to understand and solve today's challenging problems creates the major background for graduate study at the College. A wide array of excellent supporting facilities and equipment completes the setting for creative study. In this environment the student takes a program of advanced courses especially designed to meet his personal professional and academic objectives as a prelude to original investigation. Participation in seminars and colloquia with faculty and visiting scholars further expands his intellectual horizons. The most significant feature of graduate work is the individual study and research leading to the preparation of a thesis.

During the graduate years a student develops his ability to think critically and analytically, to design experiments and plan research, to work effectively with the basic research tools as well as with specialized equipment, and to accept the rigorous discipline of purposeful study toward a specific goal. It is a time of discovery and excitement, of answers and new insights—the realization of personal creativity and the deep satisfaction of scholarship.

The demand by industry, government, and educational organizations for scientists and scholars is ever present. Education through the doctorate is expected of those planning to enter college or university teaching. The Master or Doctor's degree is a requirement for many industrial or governmental research positions and employers are always seeking graduates with one or more advanced degrees for managerial positions. But a graduate education is more than an occupational requirement. Our society is increasingly in the hands of those who have broad foresight and reasoned judgment in applying sociological and technical knowledge to guide human and environmental forces. Modern civilization requires persons who can think objectively and constructively, and who can act creatively and responsibly.

GRADUATE DEGREES

The College of Environmental Science and Forestry offers graduate education in professional and scientific fields leading to:

Master of Science (M.S.)

Master of Forestry (M.F.)

Master of Landscape Architecture (M.L.A.)

Doctor of Philosophy (Ph.D.)

POST-DOCTORAL OPPORTUNITIES

Advanced education and experience opportunities for professional people and scientists are available at the College. From 25 to 30 Post-Doctoral Fellows and Associates are in residence each year to receive advanced research experience or professional education under the guidance

of faculty members with international stature. Modern facilities and instrumentation help to make the program meaningful and rewarding.

SYRACUSE UNIVERSITY

The College of Environmental Science and Forestry is a unit of the State University of New York. There are six major buildings located on a 12-acre campus which is immediately adjacent to the campus of Syracuse University. This mix of a State operated College and a large privately operated University Center is a stimulating environment for graduate education.

Syracuse University is one of the excellent private universities of the United States with an undergraduate student body of over 10,000 and more than 4,000 graduate students. College of Environmental Science and Forestry graduate students may utilize any relevant courses available at Syracuse University in developing their graduate education. This gives each student the advantages of working closely with an excellent College faculty, and at the same time having access to the varied capabilities of a large University Center.

College of Environmental Science and Forestry graduate students have all the privileges of students of Syracuse University. They are encouraged to take advantage of all the social, athletic, and cultural activities which this stimulating University Center provides.

GRADUATE FACULTY

The College faculty numbers about 150, with a Graduate Faculty of over 90 members. The faculty list on pages 164-178 gives the title and academic degrees of each individual. Those who are members of the Graduate Faculty are marked with an asterisk (*).

The departmental descriptions given on pages 92-111 indicate the faculty of that department and their area of special research interest. In addition, members of College and University research centers and institutes participate in and direct graduate student programs. These include:

Empire State Paper Research Institute: DENCE (Organic Chemistry and Lignin Reactions); LEOPOLD (Organic Chemistry and Mechanical Properties of Fibers and Paper); LUNER (Mechanical and Surface Properties of Fibers, Films, and Paper); MARK (Fiber Physics); MARTON (Paper Properties, Microscopy, and Pulping).

RESEARCH

Graduate education and research are interdependent and must be considered together for a realistic understanding of the College's program. Research is a major responsibility of the College required by its charter, and has been traditionally an integral part of its total academic effort.

The objectives of the College in carrying out a vigorous research program are to provide education in science and technology; to provide an

environment for professional growth, the development of creative thought, and the mastery of investigative techniques; and to create new knowledge, providing a growing resource of information for the people of New York and the Nation. The latter objective constitutes an obligation and responsibility of the College, as a publicly supported professional institution, dealing with environmental science and natural resources.

To support these objectives and obligations the State University of New York provides a budget for Organized Research which is currently about \$750,000 annually. In addition, extra-mural research support in the form of grants and contracts amounts to over \$1,000,000 annually. This extra-mural support comes from National Science Foundation, Department of Defense, National Institutes of Health, the McIntire-Stennis Program of the U.S.D.A., the U. S. Forest Service, New York Department of Environmental Conservation, other government agencies, private foundations, and industry.

Much graduate student research work is directly related to continuing programs of faculty research, and in many cases graduate students receive financial assistance from these programs.

Several research institutes and centers have been established at the College to promote research. These include the Empire State Paper Research Institute (supported by 53 companies in 13 countries), the Cellulose Research Institute, the State University Polymer Research Center, the Applied Forestry Research Institute, and the Archer and Anna Huntington Wildlife Forest Station. The United States Forest Service cooperates with the College through the Cooperative Forest Recreation Research Unit. Forest Service personnel are assigned to the College and work directly with the faculty and graduate students in developing research programs.

FINANCIAL ASSISTANCE

ASSISTANTSHIPS, FELLOWSHIPS, AND SCHOLARSHIPS

The College awards a substantial number of assistantships, fellowships, and scholarships to qualified graduate students each year. The number of students receiving these awards varies from year to year, but recently more than half of all graduate students have received such support. In many cases it is not possible to provide a stipend at the start of the graduate study period, but such support is often provided after the student has demonstrated his competence.

Students may indicate their interest in a type of financial assistance on the graduate application form. Students on fellowships or assistantships must devote full-time to graduate study and are expected to register for 12 semester hours of credit each semester. Students seeking financial assistance should complete their applications before March to ensure full consideration for an award for the following year.

College Assistantships

Assistantships are awarded students of demonstrated scholarship whose education and experience enables them to assist in laboratory instruction and research. The amount of the assistantships is \$3,100 to \$3,400 per year. In addition, tuition is waived. Students on assistantships carry 12 credit hours of course work and research per semester.

Special Fellowships and Assistantships

Fellowships and assistantships sponsored by industries, associations, and foundations are available in several departments. While the amount of stipends varies, they range from \$2,500 to \$5,000 a year. Holders of these special fellowships and assistantships are required to confine the major part of their research activities to definitely specified fields. Tuition is either waived or provided by sponsors.

Memorial Graduate Fellowships

Each year the College awards one or more Memorial Graduate Fellowships to individuals of outstanding merit. These awards provide a stipend of \$4,000 per year and a tenure of three years. In addition, a dependency allowance of up to \$1,000 per year is provided, and tuition is waived.

Tuition Waiver Scholarships—Foreign Students

Tuition waivers may be awarded to a limited number of foreign students judged to possess special academic capabilities and with demonstrated financial need, who are prepared to contribute to furthering international understanding and good will. Tuition waivers also are made available on a reciprocal basis to selected foreign students in special cooperative programs maintained between certain foreign institutions and the College. The student does not receive any actual cash payment, but the tuition charge is waived, therefore, other sources of funds must be assured for living expenses and travel. Requests for such tuition waivers may be made on the graduate application form.

SCHOLAR INCENTIVE PROGRAM

Qualified New York State residents are eligible for Scholar Incentive Program grants and State University Grants-in-Aid which vary with the net taxable family income of students, and the level of study, and provide substantial reductions in tuition. For details, contact the Financial Aids Officer at the College.

LOANS

Graduate students may be eligible for various types of educational loans. The New York Higher Education Assistance Corporation offers loans to residents which are interest free until after college, and then charges 7 per



cent annual interest under current regulations. Repayment terms are arranged after graduation.

A graduate student who is a U.S. citizen and who needs financial assistance may borrow up to \$2,500 a year under the Student Loan Program of the National Defense Education Act of 1958. No interest will accrue until 9 months after leaving college, and then it is at 3 per cent. Part of the loan will be canceled if the student becomes a public school teacher or college teacher or enters military service. A 10-year repayment period is allowed.

OTHER FORMS OF SELF SUPPORT

A limited number of graduate students without assistantships or fellowships may be employed at an hourly rate to assist in laboratories and other College activities. Such hourly employment does not include free tuition.

Employment also may be sought on a part-time basis through Department Chairmen, the Student Services Office of the College, or the Syracuse University Placement Office.

TUITION AND FEES

Graduate tuition and fee charges are \$600 per semester for New York State residents and \$750 per semester for others. Student activity fees are about \$25.00 per year. A commencement fee of \$25.00 is charged at the time of graduation.

EXPENSES

Living expenses are subject to considerable variation. Many graduate students live in private homes where prices range from \$12-\$15 per week for a single room, and from \$15-\$20 per week or more for a double room. Married students may be provided apartments in Syracuse University housing units at charges which are below those available in privately owned buildings. Expenses for textbooks and supplies average \$125 or more a year. Personal expenses vary depending on needs and tastes.

All graduate students are required to have accident and sickness insurance. Fellowships funded through the State University Research Foundation are required to take the health and accident insurance available through the Foundation.

REQUIREMENTS FOR DEGREES

Graduate programs are flexible and developed individually. Each program is planned by the major professor with the student to meet his particular academic and professional needs. Sometimes this includes undergraduate courses for which no graduate credit can be given. In every case emphasis is placed on outlining a study program leading to a high level of scholarly achievement.

An entire program for each student is usually planned during the first weeks of the academic year. It must be approved by the major professor, department chairman, and Dean of Graduate Studies. The program is modified as required upon recommendation of the major professor and with approval of the Dean of Graduate Studies. A thesis committee consisting of the major professor and two other faculty members is appointed early in each student's study program. In some departments, all graduate students are required to engage in an appropriate teaching assignment as an academic degree requirement.

Master. All programs leading to the Master of Science, Master of Forestry, and Master of Landscape Architecture degrees require at least 30 semester hours of graduate credit. At least half of the credit must be in courses numbered 600 or above. Graduate-level course work (passed with an average grade of at least B) takes up 12 to 24 hours. The remaining credit-hour requirement is met by submitting a thesis presenting the results of original research. Acceptance of the thesis depends on clear demonstration of ability to search and evaluate pertinent literature independently, to plan and carry through independent and important investigation, to interpret the significance of findings, and to present the subject in a well-organized, lucid, and scholarly thesis. The student must pass a final oral examination in which he defends his thesis and demonstrates his knowledge of related subject areas.

Candidates for Master degree must spend at least two semesters in residence at the College of Environmental Science and Forestry.

Ph.D. Quality of work is especially emphasized for the Doctor of Philosophy degree. The student is required to penetrate the frontier of knowl-

edge in his particular field and make a definite contribution to this knowledge. He is required to demonstrate original scholarship of a high order in his search and evaluation of literature, in the planning, execution, and interpretation of his own research, and in the presentation of his findings in a thesis. Subsequent publication in a scholarly journal is expected.

There is no minimum credit hour requirement for the Ph.D. Each student must pass a qualifying examination before being admitted to candidacy. This two-part examination consists of a preliminary examination taken early in the period of residence to assist in planning a course work and independent study program, and a written and oral comprehensive examination to test breadth and depth of knowledge. There is no College-wide language requirement. However, competence in a foreign language, statistics, computer programming, or other "tools" may be required where they are relevant to the student's field of study. A candidate for the Ph.D. degree with only a Bachelor degree must be in residence for at least two full academic years. A candidate having a Master's degree must be in residence for at least one full academic year. The final requirement is the presentation and defense of the Ph.D. thesis or dissertation which must represent an original contribution to knowledge.

ADMISSION REQUIREMENTS

Admission to graduate study may be granted only to applicants with at least a Bachelor's degree from a recognized institution, whose preparation has been suitable in quality and content for the proposed field of major study. Applicants will be evaluated on the basis of the following: (1) their academic record should show approximately a "B" or 80% average for the junior and senior years; (2) Graduate Record Examination Aptitude scores and in some cases, subject matter (advanced) tests indicative of graduate study ability; (3) supporting letters of recommendation, and (4) where appropriate, other evidence of scholarly achievement and potential. Admission is very selective with priority given to applicants who have high scholastic standing.

All applicants are required to submit Graduate Record Examination aptitude scores. Where subject matter (advanced) test scores are required, they are indicated in the departmental statements which follow. In some instances GRE scores may not be required for applicants who have completed a Master degree at an American university; however, these scores are essential in award of financial assistance. This examination is offered several times per year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540. Test scores should be sent to the Dean of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210 (Institutional number R2530).

The College provides a special form for application for graduate work. Requests for information and applications should be addressed to the Dean of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210.

Under special conditions and on recommendations of the department chairman and the Dean of Graduate Studies, students may be admitted and carried on a nondegree status. Nondegree students accepted for special study programs may be regarded as visitors and normal graduate standards need not apply.

ACADEMIC REQUIREMENTS

Graduate students are required to maintain an average of B or better in all course work. Students whose cumulative grade point average falls below "B" at the end of any semester are placed on probation for the following semester. A student placed on probational status must qualify for full standing by the end of that semester or be subject to dismissal from graduate study.

INTERNATIONAL STUDENTS

Citizens of other countries with special educational objectives are accepted for graduate study in all programs. They must show satisfactory evidence that they have completed studies in their major field equivalent to those at a recognized American institution with a scholastic record equivalent to a B average in their junior and senior years. They must submit Graduate Record Examination scores as explained in the section on Admission Requirements. Also, applicants whose native language is other than English must submit scores on the Test of English as a Foreign Language (TOEFL) as an indication of their ability with the English language. This examination is offered several times per year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. In submitting test scores, request that they be sent to the Dean of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210.

International students who have completed a Bachelor or Master's degree at an American college may be admitted as graduate students. They must apply for admission as explained in the section on Admission Requirements. In this case the requirement of TOEFL scores may be waived.

HOUSING

The College does not operate dormitories or student residences. These are facilities of Syracuse University. Married students are certified to the Syracuse University Married Students' Housing Office, through which the University operates rental dwelling units for families with and without children. Veterans of the Armed Forces of the United States and her allies are given priority. Married students who wish to live in University housing should write to the Director, Married Student Housing, 1528 East Colvin Street, Syracuse, New York 13210. Formal admission to graduate study is required before such requests will be granted.

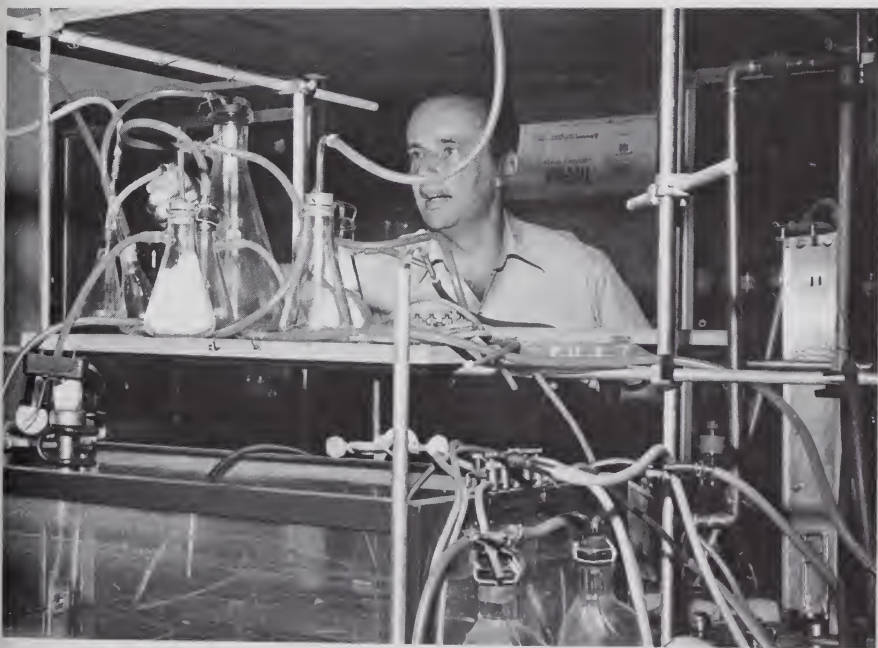
EXCHANGE OF GRADUATE STUDENTS

Formally admitted degree graduate students in any unit of the State University of New York may be authorized to take courses at the State University College of Environmental Science and Forestry without going through the usual application and admission procedures. Such exchange students must have the necessary prerequisites for the course, or permission by the instructor, and there must be available room in the course. These matters will be decided by the Professor and Department Chairman or School Dean involved and handled through the Dean of Graduate Studies.

To be admitted as an exchange student will require a statement from the student's Department Chairman indicating the course (or courses) involved, and that the course (or courses) will be accepted toward completion of his degree requirements. Whenever feasible the student will pay appropriate tuition and fees for the course(s) at his institution. If the student has a waiver of tuition at his institution, that waiver (tuition receipt) will be recognized at the College. This authorization will apply *only* to College of Environmental Science and Forestry courses, not to Syracuse University courses.

GRADUATE PROGRAMS

Graduate education may be pursued at the College in any of the departments or programs listed below. Also there are wide opportunities for interdepartmental and interdisciplinary programs, since the faculty of the depart-



ments cooperate in executing research, in planning graduate programs, and in teaching courses. Interested students should review the descriptions of all programs related to their field of interest to get a clear picture of the wide range of graduate education available within the College. In addition, they should keep in mind that the great variety of course offerings at Syracuse University and the State University Upstate Medical Center are also available. Course offerings at these institutions are not listed in this catalog. This arrangement means that graduate students at the College work intimately with a distinguished faculty, in a small campus environment, and yet have all of the educational and social advantages of a large university complex at their disposal.

The descriptions which follow should be reviewed in relation to the following administrative divisions:

School of Environmental and Resource Management

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SCHOOL OF ENVIRONMENTAL AND RESOURCE MANAGEMENT

Forest Resources Council

LEAF, *Chairman* (Forest Soil Science); BERGLUND (Silvics); BLACK (Watershed Management); CRAUL (Forest Soil Science); ESCHNER (Forest Influences); HERRINGTON (Meteorology); JOHNSON (Silviculture); LEA (Director, Summer Field Session, and Silviculture); MINCKLER (Hardwood Silviculture); RICHARDS (Silviculture, and Environmental Science); ——— (Forest Tree Breeding).

Concern for the forest ecosystem provides a major focus for the work in this field. Translation of these concerns to broader questions of environmental quality is given attention. Well-equipped laboratories, specialized equipment, and greenhouse facilities are available to graduate students.

Graduate study in all aspects of silviculture and its supporting sciences is available. Emphasis can be placed on fundamental biological relationships or on applications of these relationships in the forest environment. Programs are coordinated with other areas of specialization through cooperation between the Forest Resources Council, other departments of the College, Syracuse University, and the U. S. Forest Service Research Unit. A major strength is the close association of scientists representing a broad spectrum of specialists, stimulating intra- and interdisciplinary cooperation.

Graduate emphasis may be directed to silvics, silviculture, forest stand development, forest influences and watershed management, forest tree genetics and tree improvement, forest meteorology and climatology, forest soil physics and forest soil fertility-nutrition, and site relations.

Extensive College forests of nearly 25,000 acres include most forest types of the Northeast, as well as plantations, seed orchards, and a tree nursery, all of which offer exceptional opportunities for field study under a wide variety of environments. Major field installations include long-term northern hardwood stand improvement studies, the oldest continuously studied forest fertilization trials in the United States, and two large microclimatic tower complexes with associated automated data acquisition systems and instrumentation.

Quantitative Methods Council

CUNIA (Operations Research, Statistics Mensuration); KASILE (Experimental Design, Biometrics, Statistics); SULLIVAN (Mensuration); ——— (Biometrics, Inventory and Research Design, Statistics).

Graduate study in forest biometrics is concerned with applications of various mathematical concepts and techniques to forestry and to forest related activities, that concern forests, associated plants and animals, forest products, and competing uses of forest land, or formerly forested land.

Graduate programs leading to Master and Doctorate degrees are worked out to meet the interests of each student. Facilities include two computer centers with an IBM 370 and CDC 3200 system and a new statistics laboratory with modern equipment. These programs may be



strengthened by supplementary courses taken at Syracuse University, especially in the School of Management and in the Department of Mathematics, and by consultation with associated faculty.

Programs are available in two broad categories: applications of biometry to forest science and adapting the principles of operations research to practical management problems. It is also possible to have forest biometrics or operations research or both as a co-major with another program at the College.

Applications of forest biometrics include designing sample surveys and experiments, analyzing resultant data, and interpreting (in a statistical sense) the results obtained. Forest science, as used in this context, includes all aspects of forests and forestry that have rigorous scientific basis.

Operations research is concerned with applications of optimization techniques such as mathematical programming, simulation, network analysis to many forest management problems in the private and government forest enterprises. Areas of application are very wide and may include such problems as choice of best alternative in land use, optimization of timber production in given forest areas, optimum planning for logging operations, industrial engineering problems in woodlands or mill operations, and so on.

The graduate faculty in forest biometrics also serves as consultants to faculty and students from all the Schools of the College with respect to their applications of statistics, biometrics, and operations research.

There is a very strong demand for biometricians, statisticians, and operations research analysts in almost every field of application, and this demand is likely to continue. Funded positions remain unfilled for want of qualified candidates. The need in relation to forestry is particularly crucial in view of the present need for dependable information about our forests and their role with respect to the current popular concern with environment and pollution.

Social Resources Council

KOTEN, *Chairman* (Management, Systems Analysis); ARMSTRONG (Industry Economics, Resource and Market Analysis); BENNETT (Economic Theory, Economic Thought in Forestry); CHRISTIANSEN (Forest Production Economics, Economic Systems Analysis); CANHAM (Regional Economics); DUERR (Managerial Economics, Resource and Market Analysis); GARTHE (International Forestry Economics); GETTY (Forest Policy, Administration, Management); GRAVES (Resources Planning, Policy, Management); HANSELMAN (Educational Communication); HORN (Business Management, Law); MORRISON (Sociology of Outdoor Recreation); MOELLER, ECHELBERGER (Forest Recreation Research); PETRICEKS (Macroeconomics, International Forestry Economics); YAVORSKY (International Forestry Development).

Forestry Economics Program

Graduate study emphasizing the economic aspects of forestry is offered by the School in programs leading to Master and Ph.D. degrees. The Master's programs are designed to meet the needs of the graduate in forestry or forest products. They also serve the graduate in liberal arts, engineering, or business whose interests point toward the economics of forest resource management. The aim is primarily to broaden the student's understanding of the content of forestry economics.

The Ph.D. program is for those who wish to make a career as professional forestry economists in research institutions, in the academic world, or in business or government. The goals are depth of understanding and familiarity with economic tools contributory to making competent decisions in resource economics, management, and policy. Requirements are in general the same as those observed in economics departments of leading universities, except that the student completes specified work in the economics of forestry.

Whatever the program, the basic purpose is to help the student acquire the tools and facility for disciplined, logical, critical, and constructive thinking and for clear expression in this field.

Instruction at the College of Environmental Science and Forestry is supplemented by the wide range of courses available in the Maxwell Graduate School of Citizenship and Public Affairs, the School of Management, and other units of Syracuse University. Individual programs may include supporting courses in general economics, mathematics and statistics, operations research, business, international affairs, and other social sciences and related fields. The substantial library resources, computer facilities, and other resources of Syracuse University also supplement those of the College.

Graduate research in forestry economics within the School covers a broad spectrum. Examples of topics recently treated are: application of economic systems and operations research in timber management and in the manufacture and marketing of forest products; forestry investments in the face of uncertainty; economic models for public forestry decisionmaking;

history of economic thought in forestry; the financing of public recreational improvements; and forestry investment criteria in developing nations.

Forest Management Program

Graduate study in forest management offers wide opportunity for either specialization or breadth in advanced study. The faculty foster a spirit of individual initiative and free inquiry into all aspects of managerial concerns. Joint programs are common, aiming at strength and balance with relevant knowledge offered in other departments and disciplines. Graduates from various fields of study are encouraged to apply. Two areas of concentration are outlined below as exemplary of programs which permit the student to prepare himself in depth, while encouraging flexibility and broader understanding.

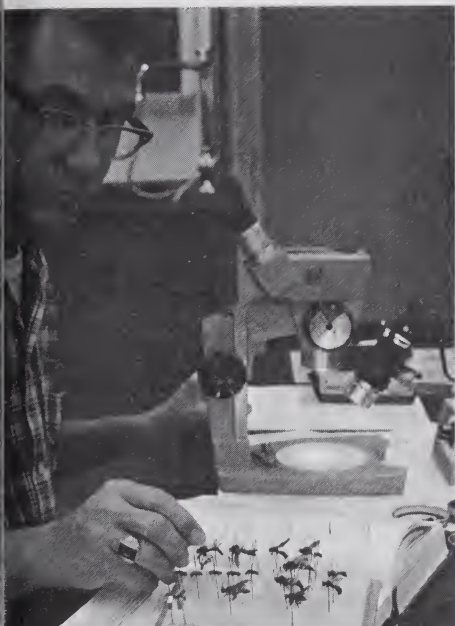
A management program prepares graduates for the field of administration or management in a public agency or a business concerned with natural resources or environmental quality at the executive, planning, budgeting, programming, operating, or leadership levels. The wide choices in other departments of the College and in the many units of Syracuse University, including the renowned Maxwell Graduate School of Citizenship and Public Affairs and the School of Management, are used to supplement offerings by forest management faculty. This enables the student to earn a Master's degree which is the forestry or natural resources equivalent of a Master of Business Administration or Master of Public Administration degree.

The Ph.D. program is scientifically oriented and strongly supported by courses in the behavioral sciences to develop the talents needed in top executive leadership in the rapidly developing fields of man-resources relationships, environmental quality, and management sciences. Interested graduates from business and other colleges qualify for the Master and Ph.D. programs by including sufficient forestry in their graduate program to provide a natural resources background.

Forest recreation is an area of graduate study and research within the management program which allows the student to pursue specialized inquiry into several aspects of outdoor recreation or to prepare for a career in teaching or government. Elective support may be drawn from courses within the College including those in landscape architecture, economics, silviculture, and zoology. Syracuse University courses in sociology, psychology, philosophy, journalism, education, and related fields offer strong support for the student preparing seriously for employment in the general field of outdoor recreation. Of special significance is the Recreation Research Branch of the Northeastern Forest Experiment Station of the U. S. Forest Service located at the College of Environmental Science and Forestry. Its Director and professional recreation researchers in residence at the College serve as adjunct faculty.

Both Master and Ph.D. candidates are presently matriculated in this program. Interested graduates with a Bachelor of Science degree in rural

sociology, psychology, urban planning, political sciences, business or public administration qualify for this program by including sufficient forestry study in their graduate program to provide a natural resources background.



SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

Forest Botany and Pathology

TEPPER, *Chairman* (Anatomy and Morphogenesis); GEIS (Ecology); GRIFFEN (Mycology and Fungus Physiology); KETCHLEDGE (Ecology and Bryology); LOWE (Mycology); MANION (Pathology); McDOWELL (Fungus Physiology); SCHAEDEL (Physiology); SILVERBORG (Pathology); VALENTINE (Genetics); WANG (Mycology); WILCOX (Physiology of Growth and Development); ZABEL (Wood Deterioration).

The program in botany and pathology is designed to provide students with graduate level instruction in basic botanical and related natural and physical sciences. Research and thesis problems are generally designed to utilize forest organisms in the development of biological knowledge. Graduate programs are offered in the fields of anatomy, morphogenesis, physiology-biochemistry, ecology, forest pathology, wood deterioration, mycology, genetics and taxonomy. Strong supporting courses in climatology, meteorology, soils, ecology, bacteriology, botany, microbiology, genetics, mathematics, chemistry and statistics, available in other departments at the

College and at Syracuse University, provide additional courses for graduate programs.

Current areas of active research by departmental faculty are: *Anatomy and morphogenesis*, factors that influence the development and form of root systems and regulate the development of root and shoot apices, cell differentiation in tissue culture; *physiology*, chemical regulation of organ growth, the nature and physiology of mycorrhizae, ion transport, mineral nutrition, biochemical aspects of cambial physiology, photosynthesis; *ecology*, dynamics of plant communities in the Adirondack Mountain Region and on the Alleghany Plateau, the influence of man on plant communities, the interaction of environmental factors during vegetational change, phytogeography and chemical ecology; *forest pathology*, disease of forest plantations, heart-rots and cankers, tree rusts and physiogenic diseases; *wood deterioration*, the effects of stains and decays on wood use and their controls, the chemistry of wood decay, toxicity mechanisms, and the bio-assay of toxicants; *mycology*, the taxonomy, sexuality, and morphology principally of wood-inhabiting fungi and microfungi; *fungus physiology*, the role of nucleic acids and intermediary metabolism in growth and morphogenesis; *genetics*, quantitative and population genetics, the heritability and natural variations in wood characteristics that are important in forest products and wood pulp; *taxonomy*, the identification, nomenclature and classification principally of fungi, bryophytes, and vascular plants.

Illick Hall, the biological science building, provides faculty and students with modern facilities for botanical research. Special facilities include rooftop greenhouses; growth chambers; herbaria and special research laboratories for tissue culture, microchemistry, microtechnique, microscopy, radiochemistry, chromatography, and computation. In addition, a cobalt-60 source, electron microscopy laboratory, and a computer center are available at the College for student use. Extensive College forests, including most forest types of the Northeast, plantations, and nurseries offer exceptional opportunities for field study of forest plants and diseases.

Research in the department is supported by private industry, the United States Forest Service, the Department of Environmental Conservation, the Research Foundation of the State of New York, a variety of Federal agencies and by the State. In addition to direct project support, the grantees also provide for graduate research assistantships.

Forest Entomology

SIMEONE, *Chairman* (Ecology and Wood-Inhabiting Insects); ALLEN (Ecology and Population Dynamics); BREZNER (Physiology); CAMPBELL (Population Dynamics); KURCZEWSKI (Morphology, Taxonomy, Behavior); LANIER (Ecology, Cytotaxonomy); NAKATSUGAWA (Toxicology).

Broad opportunities for study in forest entomology are available for the graduate student who, with the advice of his major professor, is permitted to follow a program of research supplemented by appropriate course

work at this College and at Syracuse University. On-going research includes not only classical studies on the biology of forest insects and those causing the deterioration of wood, but a wide variety of possibilities such as host-parasite relationships, host selectivity, population dynamics, insect physiology, dehydrogenases, mechanisms and enzymology of insecticide detoxification, biochemical systematics, comparative behavior, insect communications, taxonomy, histology and cytology. Selected problems may also concern the economic impact of forest insects as well as chemical, biological, and silvicultural aspects of insect control.

Informal interdisciplinary pursuits are possible in chemical ecology, genetics, forest pathology, immunology, and climatology involving other departments at this College and Syracuse University. Areas of specialization are enhanced by supporting courses in these other disciplines. Students interested in insect ecology, chemical ecology, physiology or taxonomy, for example, may pursue these subjects relative to plants and other animals by selecting courses in forest botany, silviculture, forest zoology, biochemistry, and applied mathematics.

Students and faculty have a wide range of field and laboratory facilities available for research. The several forest properties represent varied forest environments while Illick Hall provides modern controlled facilities and instrumentation. More than 18,000 square feet of indoor space is available, with access to electron microscopy laboratory, environmental chambers, ultra centrifuges, nuclear magnetic resonance equipment, gas chromatograph, isotope laboratory, cobalt source for irradiation, a sound-proof room, glasshouse, and an insectary complex affording subjection of insects to controlled as well as ambient weather conditions. The taxonomic museum houses nearly 100,000 insect species deposited by entomologists for more than half a century. A computer center provides services in all phases of entomological research.

Forest Zoology

ALEXANDER, *Chairman* (Vertebrate Ecology); BEHREND (Forest Wildlife Biology and Management); BROCKE (Bioenergetics and Wildlife Biology); CHAMBERS (Wildlife Biology and Management); DINDAL (Invertebrate Ecology); GRAVES (Vertebrate Physiology); HARTENSTEIN (Invertebrate Physiology); PAYNE (Wildlife Conservation); PRICE (Animal Behavior); TIERSON (Forest Wildlife Management); VANDRUFF (Vertebrate Zoology and Wildlife Biology); WEBB (Vertebrate Ecology and Forest Wildlife Management); WERNER (Limnology and Aquatic Biology).

Graduate studies in forest zoology include both basic and applied research on animals of the forest ecosystem, including its associated soils, water and related wildlife areas. Programs are offered in vertebrate ecology, soil invertebrate ecology, endocrinology and physiology, population ecology, animal behavior, forest wildlife biology, aquatic ecology, and forest wildlife management.



The Department and its laboratory facilities are located in the biological sciences building. They include specialized laboratories for research in physiology, soil invertebrate ecology, animal behavior, aquatic biology and wildlife biology. An extensive collection of invertebrates is available, as well as the large Roosevelt Wildlife Collection. Various temperature-humidity chambers are available, including an environmental simulating chamber which programs and records light, temperature, humidity, altitude, wind, and precipitation.

The Department has an intensive research program in wildlife biology open to graduate students on the Archer and Anna Huntington Wildlife Forest, a 15,000-acre forest in the Central Adirondack Mountain region. Many forest types are present in varying stages of management. Four faculty members are year-round residents on the area.

Field research may also be conducted on the College's Heiberg Memorial Forest and Experiment Station. Several other areas are located within a 35-mile radius of Syracuse, and frequently are used for research purposes. These include Onondaga County's Highland Forest; the Department of Environmental Conservation's game management areas—Tioughnioga, Three Rivers, Howland Island, and Cicero; the Montezuma National Wildlife Refuge; and privately-owned lands.

These facilities and areas are supplemented by the services and facilities of the College's other departments, particularly the Departments of Forest Botany and Pathology, and Forest Entomology. The School of Environ-

mental and Resource Management provides support in relating the managerial and silvicultural facets of forest resources to wildlife biology study programs. The College is adjacent to Syracuse University with its large Department of Biology, strong in physiology and developmental zoology. Available through this institution are programs in social sciences and engineering, including land use and environmental pollution.

The State University Upstate Medical Center also is nearby. Its facilities are available for graduate students whose research can be benefited by their specialized library, equipment, and faculty.

Examples of recent research include the ecology of forest wildlife species, movements of larval fish, domestication of Norway rats and pheasants, marsh ecology, hematology of woodchucks and game birds, wetland planning, nesting behavior, deer behavior, physiology of isopods, pesticides and soil fauna, physiology of hibernation, and the population dynamics of wild animals.

Forest Chemistry (Polymers, Natural Products, Biochemistry)

SCHUERCH, *Chairman* (Wood and Polymer Chemistry); LALONDE (Organic and Natural Products Chemistry); SARKO (Physical and Polymer Chemistry); SILVERSTEIN (Ecological Chemistry); SMID (Physical and Polymer Chemistry); SMITH (Physical and Polymer Chemistry); SONDEHEIMER (Biochemistry); SZWARC (Physical and Polymer Chemistry); TIMELL (Wood Chemistry); WALTON (Biochemistry).

Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance to forestry. Therefore, this department is very active in the following research areas: polymer chemistry and physics, wood chemistry, biochemistry, chemistry of natural products including ecological chemistry, and organic material sciences. (See also Interdisciplinary Program in Organic Materials Science.)

Requirements for a Master of Science or Doctor of Philosophy degree in chemistry include a research project and thesis, along with an appropriate program of courses at the College and at Syracuse University. Financial support is available to foreign students and postdoctorates in the form of fellowships, teaching assistantships, and tuition waivers.

Specific projects may vary from year to year, since they reflect the current interests of the department members. Current research projects with physico-chemical emphasis are: the chemistry, physics, solid state and solution properties of natural and synthetic polymers, including studies in thermodynamics, statistical mechanics, crystallization, morphology, elasticity, conformation of macromolecules, optical properties, polymer catalysis, mechanism of polymerizations, polyelectrolytes, ion binding to macromolecules and ion pairing; chemistry of free radicals, radical ions and charge transfer processes; structure and properties of ionic solutions in nonaqueous media; crystal structure and morphology of cell wall constituents. Current organic chemistry programs deal with synthesis of special polymers such as high temperature aromatic block, stereoregular vinyl polymers, and polysaccha-

rides, various aspects of natural products chemistry, but especially alkaloids and terpenes, isolation and characterization of insect and mammalian attractants. An active program on the structure and topochemistry of the polymeric wood components, hemicelluloses, lignins and celluloses is underway. In biochemistry, department members are studying mechanisms of action of plant growth hormones, biochemical regulation of seed germination, plant enzymology, and ultrastructural plant cytology.

Graduate research laboratories in the Hugh P. Baker Laboratory are well equipped for polymer studies, chemical, and biochemical research. Instrumentation includes analytical and preparative ultracentrifuges, Warburg respirometer, recording infrared and ultraviolet spectrophotometers, mass spectrometer, differential refractometer, electron spin resonance spectrometer, nuclear magnetic resonance spectrometer, automatic membrane osmometers, solid and solution state light scattering photometers, recording polarimeter and optical rotatory dispersion spectrometer, several ultramicrotomes, electron microscopes, X-ray diffraction, instrumentation chromatography and cold laboratories, and radiochemical laboratories with counters for solids, liquids, and gases.

SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

Paper Science and Engineering

O'NEIL, *Chairman* (Pulping, Bleaching and Paper Properties); GORBATSEVICH (Pulping, Bleaching, Paper Technology, and Paper Properties); STENUF (Chemical Engineering, Instrumentation, Thermodynamics, Process Control, Metallurgy and Corrosion); STRAUSS (Paper Properties, Paper Coating, Pulping, and Bleaching).

The pulp and paper industry is one of the most rapid in rate of growth among all major American industries and is fifth largest in the nation. The need for professional men with advanced education in science, engineering, and technology is increasing at a rate more rapid than the growth of the industry. The College pioneered in providing graduate study in this area in 1920 with the organization of the Department of Paper Science and Engineering.

Since its inception, the Department has maintained a singularly high position in professional education in providing personnel for the continuing development of the pulp, paper, and allied industries. Its graduates, who are in constant demand, are located throughout the world.

The graduate program reflects the strong trend toward diversification in the industry and offers opportunities for obtaining Master of Science and Doctor of Philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Advanced courses are offered in such diverse areas as engineering, physical and organic chemistry, polymer chemistry, paper physics, and fiber morphology, as well as specific areas of pulping and paper properties.

Major research areas in the Department are: chemistry of pulping and

bleaching; physical properties of fibers; characteristics of the paper web; chemical engineering operations as related to the pulping and papermaking processes; utilization of new raw materials; flow properties of papermaking materials.

Walters Hall, opened in 1969, is devoted exclusively to education and research in this field. It contains a large number of research and special purpose laboratories which house sophisticated equipment. This new facility will enhance the existing graduate program.

The research program is designed to generate new information regarding the fundamentals, the science, the engineering and the technology of the papermaking process as a contribution towards progress and the future development of the industry. Those efforts are made possible by the use of advanced techniques such as electron microscopy, specialized spectrophotometry, nuclear magnetic and electron spin resonance and nuclear tracer techniques, all within the framework of one of the outstanding research facilities in the field. Also included is a modern clinical engineering laboratory designed for studies in all phases of unit operations, processes, process control, and thermodynamics.

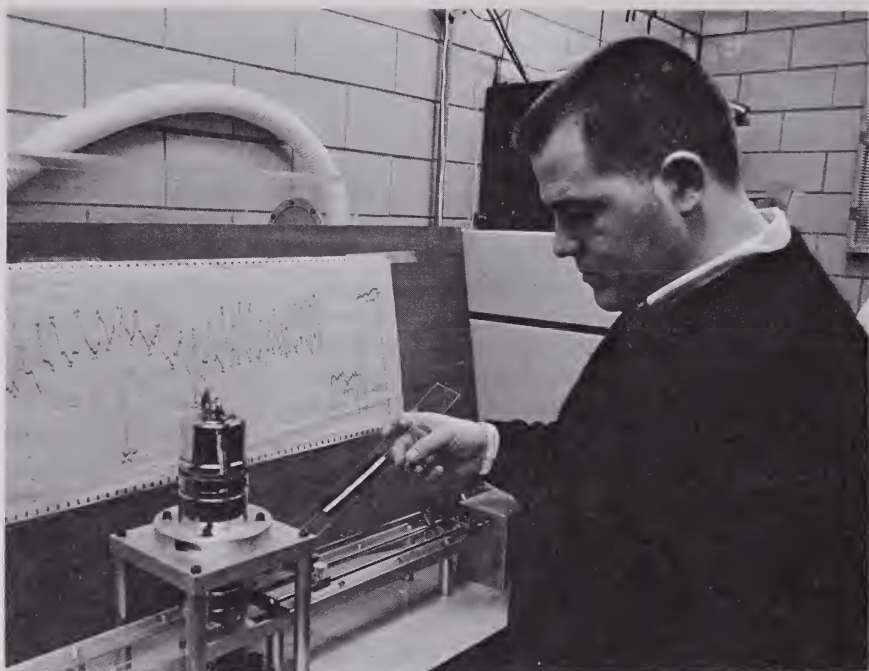
The Department maintains an experimental pulp and paper mill equipped with machinery and instrumentation for studies in many facets relating to this industry. These studies include pulping, pulp purification, reuse of secondary fibers refining, investigations of paper additives, and papermaking. This facility includes a paper machine, a 400 horsepower double disk refiner, a two-pocket grinder for mechanical pulping and auxiliary equipment.

Recent research has been directed to fundamental studies of pulping, bleaching, additives, recovery of secondary fibers, the papermaking process, reactions of wood components during mechanical and chemical treatments, evaporation, fluid dynamics, heat transfer, the structure of wood and wood fibers, and chemical and fiber recovery.

Wood Products Engineering

DAVIDSON, *Chairman* (Organic Materials Science); ANDERSON (Wood Quality-Growth Relations); CÔTÉ (Cellular Ultrastructure); DE ZEEUW (Wood Anatomy, Structure-Property Relations); MEYER (Wood-Polymer Systems, Radio Isotope Techniques); MOORE (Bonded Materials Technology); PENTONEY (Mechanical Behavior, and Fracture Mechanics); SIAU (Protective Treatments, Transport Processes); SKAAR (Wood Physics); G. SMITH (Materials Marketing); WHITT (Industrial Engineering).

Graduate study is in wood science, wood technology, production systems engineering in the wood products industries, and wood products distribution. The principal objectives are to develop originality and the analytical approach to problem solving. The student may emphasize appropriate phases, including the mechanical properties of wood, structure and anatomy of wood, cellular ultrastructure, quality of wood, processing of wood into



various forms and products, industrial management and production systems engineering of wood manufacturing plants, distribution of wood products, organic materials science, physical chemistry of wood treatments, fluid treatments, and wood physics.

Research problems are selected after faculty-student consultation. Typical problem areas include variations in wood structure caused by ecological factors; ultrastructure of cell walls; preservative treatments for insects, fire, and decay resistance; protective or aesthetic coatings; machining variables; bonded materials technology; mechanical and physical properties of wood and structure-property interaction of polymeric materials; composite material properties and design; chemical enhancement of wood; problems of the distribution enterprise for lumber and manufactured products and production engineering in wood products manufacture.

Modern laboratories and instrumentation are available for advanced research. There is a close liaison with specialists in other disciplines concerned with wood research, so that interdisciplinary approaches to problems are possible. Syracuse University course offerings, especially in the College of Engineering, are available to supplement those of the College of Environmental Science and Forestry in planning graduate study programs.

Undergraduate backgrounds required for the diversified programs in the Department depend upon the student's interests in his graduate study. He may have majored in the natural sciences, forestry, wood science, wood technology, engineering, or certain of the social sciences, such as economics

or business administration. Programs of graduate study in Wood Products Engineering may be built on any of these foundations.

Special study and research opportunities exist in the wood-using industries. Close cooperation is maintained with these industries by the College. The large volume and variety of wood products processed within New York State creates a favorable climate for graduate study in this field.

Forest Engineering

TULLY, *Acting Chairman* (Structural Design, Hydrology, Soil Mechanics); BENDER (Geodesy, Remote Sensing); BROCK (Analytical and Interpretive Photogrammetry); LEE (Systems Analysis, Computer Science); PALMER (Industrial Engineering).

The *Forest Engineering* program in the Department is articulated closely with course offerings of the Civil Engineering Department and the Industrial Engineering Department of Syracuse University. This Master's program offers a unique opportunity for graduates with a Bachelor of Science degree in Forestry to obtain advanced preparation in the engineering components of resources management, and environment management based on the fundamentals of civil and industrial engineering, systems analysis, computer science, and management science. The diverse resources of other Schools and Departments of the College provide specialized emphasis to this graduate program where appropriate.

The *Photogrammetry* program is an individually designed Master or Doctor program in Analytical Photogrammetry, Photogrammetric Systems, Photo Interpretation and Remote Sensing. Graduates with Bachelor of Science degrees in forestry or in engineering, geology, physics, or mathematics qualify for graduate study in Photogrammetry.

Although the *Forest Engineering* and *Photogrammetry* programs have been well established for several years, the Department of Forest Engineering is newly established, and graduate degrees earned under these programs are still under the administrative overview of the Forest Management Department.

SCHOOL OF LANDSCAPE ARCHITECTURE

SEARS, *Dean* (Natural Area Studies); EARLE (Art, History of Environmental Development); VIETTEL (Plant Materials, Computer Graphics); REIMANN (Methods and Philosophy of Design).

The School of Landscape Architecture is unique in its location in the College of Environmental Science and Forestry, whose campus is immediately adjacent to Syracuse University. This provides for a strong base in ecology, the natural sciences, resources management, recreation, and for development of a diversity of landscape architectural programs interrelated with architecture, planning urban studies, and the social and behavioral sciences.

Students with undergraduate degrees in landscape architecture may choose to further develop skills in the landscape design process and apply

them to the study of more complex environmental problems, or to areas of special interest. They may also choose to focus mainly on parametal areas of interest such as identified above, with a view toward expanding their background in environmental concerns. Those whose undergraduate work has been in other areas are invited to focus directly on landscape architectural studies or to develop potential relationships between their prior disciplines and the profession of landscape architecture.

Consistent with the wide-ranging environmental philosophy of the School, graduate programs are developed to enhance each student's background, capability, and intentions. The general format is not highly structured but more individually oriented in three broad areas. These include course work in landscape architectural studies; in areas designated as directly pertinent to a particular program intention; and in elective areas to serve more general and widespread educational interests. Students with undergraduate backgrounds not in landscape architecture, architecture, or other design oriented programs usually will devote two or three semesters developing graphic skills, design capabilities and other basic disciplines in preparation for the Master of Landscape Architecture program.

Research at the School, both sponsored and independent, centers on man-environmental relationships, particularly those of a current, critical nature. Graduate programs also usually include some investigative research in one of these areas, culminating in the preparation of a thesis.

The combination of the College library and the several libraries on the University campus offer excellent in-depth reference material to support study programs. Facilities at the School are extensive and include drafting, reproduction, model making, recording, photographic, and projection equipment. The College maintains a computer center which is used primarily for instruction and research and is available for individual use by graduate students.

The curriculum of the School includes a semester of study in a foreign location as a regular part of its undergraduate program. The location for this semester of study varies at two- to three-year intervals and is conducted in conjunction with the State University Office of International Studies and World Affairs. Graduate students are encouraged to fully utilize this unique feature as a resource for advanced study in particular environments or in studies of cultural and environmental relationships.

Outstanding professionals periodically visit the School to discuss their special interests and to serve as critics and lecturers to the various programs. In addition, the School, through its faculty and alumni, maintains contact with a great many landscape architectural firms, planning agencies, park systems, and governmental organizations throughout the country.

The Syracuse area has the largest concentration of landscape architectural firms in the State, outside of New York City. With a metropolitan population of nearly three quarters of a million, the city has many progressive, urban-oriented studies and projects in process. Also, its central location is most favorable for access to other urban areas. New York State, with

its large population base, has a rich variety of recreation areas administered by diverse governmental agencies and private owners. These vary from vest pocket parks in urban areas to the 2-million-acre Adirondack Preserve, and thus offer an ideal opportunity for study and research at many levels.

The profession of landscape architecture is experiencing its most rapid expansion in history. Its scope is increasing geometrically as man's concern for his environment grows. The opportunity to use additional training to better understand and satisfy the changing relationships of man and his environment and to fill a desperate need for landscape architects in education, in private practice, and in public service promises a rewarding career.

Applicants who have an undergraduate degree in a design or art oriented program are required to submit a portfolio of their work as a part of their application materials. Portfolios will be returned.

INTERDEPARTMENTAL AND MAJOR INTERDISCIPLINARY PROGRAMS

Interdisciplinary graduate study programs at the College of Environmental Science and Forestry are both of an informal and formal nature.

Interdepartmental Programs

Informal programs are of long tradition and permit students to select thesis topics and develop programs from a broad spectrum of professional and science topics in forestry, forest products, the physical and biological sciences, engineering, and landscape architecture involving the supporting resources of several departments. These informal interdisciplinary programs are achieved readily through flexible degree requirements and the assignment of thesis committee members representing the key supporting areas.

Some of the major areas of informal interdepartmental programs are listed below. Other programs suggestive of the range of topics available to students in the informal interdisciplinary approach are subjects involving the biological sciences and biochemistry; paper science, engineering, and plastics; wood products engineering, wood science, and polymer chemistry; silviculture and the botanical sciences; tree improvement and genetics; and wildlife biology and resources management. Though considerable breadth and flexibility are achieved in these informal interdisciplinary graduate study programs, students are still required to meet in full the degree requirements of their major department.

Forest Land Use and Regional Planning. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management and Landscape Architecture. See the statements of these Schools for further information.

Forest Soils. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management; Biology, Chemistry, and Ecology; and Environmental and Resources Engineering. See the council and departmental statements in these Schools for further information.

Chemical Ecology. Interdepartmental graduate programs involving the School of Biology, Chemistry and Ecology. See the departmental statements in this School for further information.

Forest Recreation. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management and Landscape Architecture. See individual School statements for further information.

Plant Physiology—Biochemistry. Interdepartmental graduate programs involving the School of Biology, Chemistry and Ecology. See the departmental statements in this School for further information.

Approved Interdisciplinary Programs

Formal interdisciplinary programs leading to Master and Doctor of Philosophy degrees are available in the areas of *World Forestry*, *Water Resources*, and *Organic Materials Sciences*. These three programs are designed to permit greater supporting subject breadth and topic focus than is available in the departmentally based informal interdisciplinary programs. These formal interdisciplinary programs are described below:

World Forestry

Program Leader—CHARLES C. LARSON, Professor of World Forestry, Director of International Forestry, and Dean of the School of Environmental and Resource Management.

Graduate study and related research in world forestry is a College-wide activity supported by faculty representing the major areas of professional faculty specialization and broad backgrounds of foreign forestry experience. The nontechnical elements of the program are supported by a wide variety of course offerings in the Maxwell Graduate School of Citizenship and Public Affairs, the Department of Geography and other departments of Syracuse University. Opportunities for field training and research in tropical forestry and related fields are available to qualified participants in this program, under cooperative agreements maintained by the College with the University of the Andes, at Merida, Venezuela, and the Institute of Tropical Forestry of the U.S. Forest Service, at Río Piedras, Puerto Rico. The College also participates in the program of the Organization for Tropical Studies which provides opportunities for advanced study and research in tropical forestry and related fields for selected graduate students.

Graduate study in this field is aimed at supplementing and enriching the student's technical forestry knowledge and providing the broad background deemed necessary for effective service in foreign forestry. This includes service as forestry advisor, teacher and research specialist with national and international agencies, private business and industrial firms, philanthropic foundations and voluntary service organizations whose activities include the development and/or use of forest resources in other lands.

At the Master's level, program emphasis is on the attainment of general competence in foreign language, cultural anthropology, world geography, history, and international affairs, plus a broad understanding of the world forestry situation. While the candidate is urged to devote major effort to formal course work, a thesis is required to provide a creative experience in

critical study and original thinking. Sufficient flexibility is maintained to enable the student to focus his studies on some aspect of world forestry either global, regional or national in scope.

At the doctoral level, program concentration is on a specialized discipline area such as forest botany, forestry economics, forest management, silviculture, or wood products engineering. Orientation to the world forestry field in this case is achieved in part through the selection of formal course work, and in part through providing an opportunity for the student to conduct his thesis research in residence abroad. Major program emphasis is placed on a thesis representing a significant contribution in original study in a world forestry problem area.



Water Resources

Program Leader—PETER E. BLACK, Associate Professor, Watershed Management.

The College is concerned broadly with biological and managerial relationships of forest resources, and the productive uses and benefits of forest products and services. The College has particular interests in the ecological and biological relationships having to do with the management and utilization of water resources; with problems of water quality, quantity, and availability as these are related to land use and development activities; and with the special problems of the forest industries which utilize water in manufacturing processes or produce by-products which affect water quality.

The rehabilitation, protection and improvement of watersheds is an important corollary area of interest.

Graduate study programs in water resources may be arranged on an informal basis within several departments of the College to include the disciplines of forestry economics, forest management, forest engineering, silviculture, landscape architecture, forest zoology, forest entomology, forest chemistry, and paper science and often involve support from several Colleges of Syracuse University.

The formal Interdisciplinary Program in Water Resources was organized in 1968 to supplement departmental programs by providing a sound basis for graduate academic programs designed to emphasize the multidisciplinary aspects of water resources. This effort recognized that water relationships are important in almost every aspect of human concern and merit attention as integrative and central elements rather than accessories. The Water Resources Program makes available to graduate students pertinent resources of the College and of Syracuse University, and where appropriate, those of other units of the State University.

The program is primarily for doctoral students. It is not structured in terms of required courses or content. Attention is given to the particular objectives of each student who enrolls in the program. Within the framework of the general graduate study requirements of the College, courses, problems and seminars are selected to attain the specific objectives and special interests sought by the student. The academic competence required is demanding. The programs arranged are broadly integrative rather than concentrated in a discipline. Critical review of the program proposed for each student is made by an assigned program committee to ensure that institutional standards are maintained and program objectives are met.

A major professor is assigned by the Program Leader to accept primary responsibility for the program of each student. Two additional faculty members in areas of expected academic or research emphasis are also selected. These three faculty members constitute the academic program committee for the student. The student is required to submit a formal report to the program committee consisting of a detailed work plan describing and defending his academic and research objectives and a schedule of courses and other elements of his contemplated study. This report is reviewed by the program committee, and is made a part of his permanent file. It is reviewed and updated at the beginning of each semester. The program committee will also serve as the thesis committee.

Organic Materials Science

Program Leader—KENNETH J. SMITH, JR., *Associate Professor*, Department of Forest Chemistry, and Research Associate and Assistant Director, State University Polymer Research Center.

Organic Materials Science is that segment of the natural sciences that deals with structure-property relationships in organic materials. The College has long been involved in various aspects of Organic Materials Science

through programs in the sciences of paper, polymers and wood. An understanding of the behavior of materials in general has developed rapidly in recent years and it is now clear that many of the fundamental concepts of material properties are applicable to both natural and synthetic polymers. This thinking has led to establishment of the new interdisciplinary program in Organic Materials Science. This program involves the Departments of Forest Chemistry, Paper Science and Engineering, and Wood Products Engineering, the Empire State Research Institute, the Cellulose Research Institute, and the State University Polymer Research Center.

Organic Materials Science strives to instill in the student a broader perspective than is normally achieved in standard academic programs. This is accomplished by uniting the students' immediate research interests to larger goals involving several disciplines. In this manner a generalization of interest is acquired without sacrificing scientific rigor and depth of knowledge in more restrictive areas. Materials of current research activity include films, fibers, elastomers, composites, antithrombogenic materials, membranes, polyelectrolytes, polysalts, fiber assemblies, wood, paper, and wood-polymer systems, and involve studies in thermodynamics, statistical mechanics, chain conformations, crystallization, crystal morphology, X-ray, light scattering, polymerization, polymer reactions, wood and paper physics, elasticity, contractility, heat and mass transport, and paper properties. See also the sections of the participating departments and institutes.

Although graduate programs in Organic Materials Science are available at both the master and the doctoral level, it is expected that most students work for the doctoral degree. Programs consist of course work and research. Course work requirement is tailored to build upon the individual student's undergraduate background and experience. Entering students are expected to have a Bachelor's degree in chemistry, physics, engineering, polymer science, wood and paper science. The course work portion of the Organic Materials Science program will be directed toward background preparation in solid state and polymer science. Near the end of the student's course work program he will be exposed to the modern concepts of the structure-property relationships that are of importance in organic materials. Research topics will be selected to permit the student to explore in depth an aspect of organic materials in which he has a particular interest.

Students registering in the Organic Materials Science program satisfy all college-wide requirements for advanced degrees. Each student will be assigned a major professor and a faculty committee who will help him plan his course work program and who will serve as consultants on his research project. Courses will be selected from those offered, both at the College of Environmental Science and Forestry and the Colleges of Engineering and Liberal Arts at Syracuse University. The research work will be carried out in College of Environmental Science and Forestry laboratories which are particularly well equipped for materials science studies.



VIII

CONTINUING EDUCATION

The philosophy that education is a lifelong pursuit is an ancient one, and was written into the law creating the College. This concept is doubly important to the sciences and professions in this technological age, when new knowledge is bursting in all directions. Hence, the College has, over the years, succeeded in communicating knowledge on forest resources management, utilization and conservation to a wide variety of off-campus publics. The entire College faculty has contributed to these programs.

Conferences, symposia, seminars and short courses on various aspects of forestry and the related sciences are conducted at both the basic and applied levels. Audiences include forest owners, managers, and operators; wood engineers and forest industries personnel; academic and scientific groups, conservation and recreation personnel from local and other public and private planning groups and citizen-action committees. General and technical publications, a specialized film library, series of radio programs, a

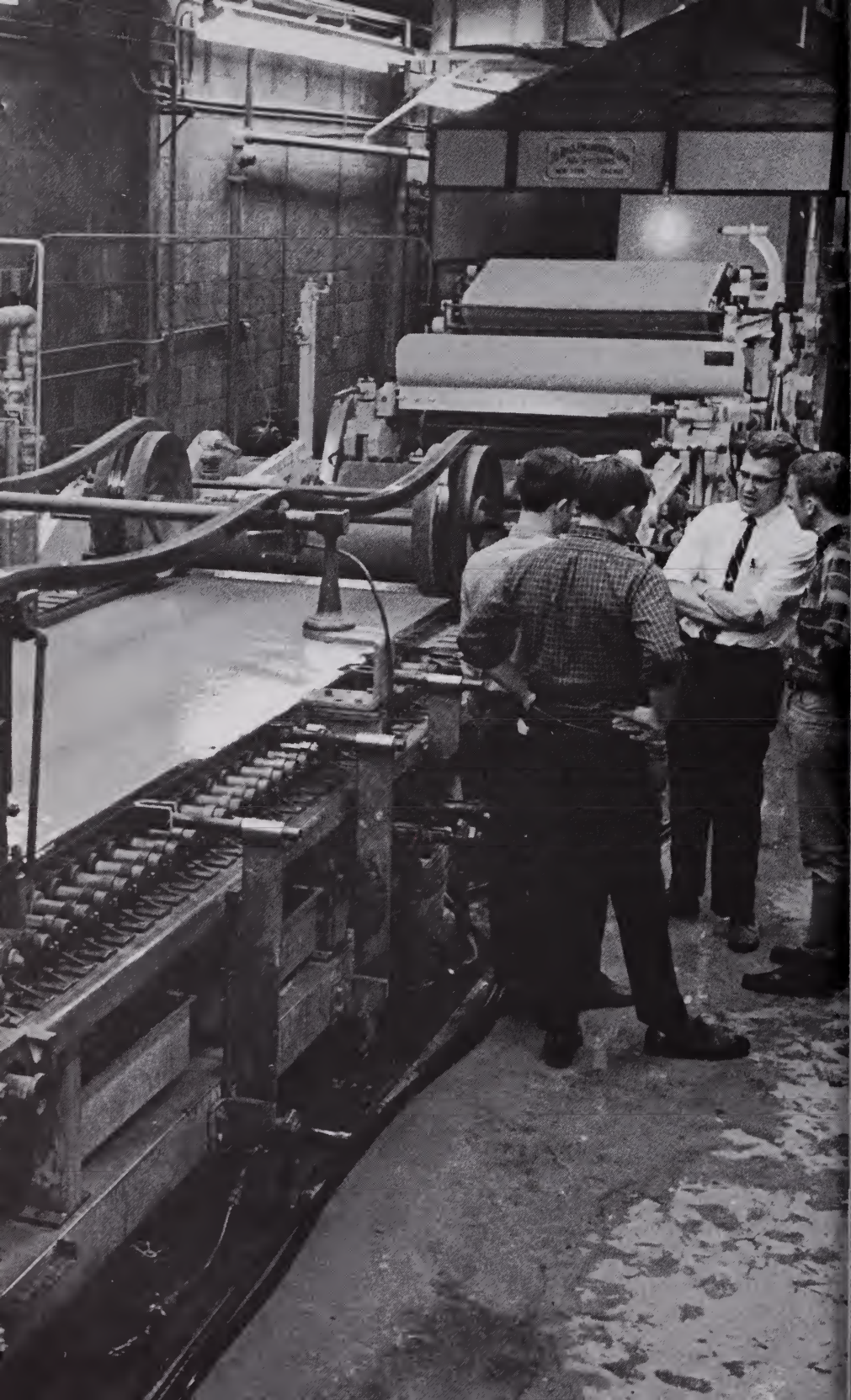


speakers' bureau, and a limited number of special programs on commercial television are the primary mass media employed.

The College recognizes that the informational needs of New York's citizens are undergoing change. Some of the factors now affecting the continuing education program are: the abandonment of farmland and the increasing urban character of the population, the changing pattern of ownership of forestland, the rise in level of education and sophistication in a more affluent society, the dynamics of technological change, and the increase in leisure time, greater mobility in travel, and outdoor recreation.

Expansion of "in-service" training courses, establishment of "environmental learning centers" on College forest properties, and production of media materials for public information and education are examples of activities directed towards updating and upgrading professional clients and broadening the public's awareness and appreciation of New York's forestlands and other natural resources.

For information on specific continuing education projects, inquiries should be sent to: Dean, Public Service, Continuing Education and Educational Communications, State University College of Environmental Science and Forestry, Syracuse, N. Y. 13210.



IX

COURSE OFFERINGS

The academic resources of three institutions—the State University College of Environmental Science and Forestry, Syracuse University, and the State University Upstate Medical Center—are available to undergraduates and graduate students in developing their study programs at the College.

In addition to the many professional and basic science courses offered by the College, a wide range of offerings are taken either as required courses or are available as electives at adjacent Syracuse University. The required courses are in certain subject areas of chemistry, engineering, physics, mathematics, geology, English, business law, personnel relations, and public address. The elective courses include most academic offerings of Syracuse University and representative subject areas are the humanities, social sciences, life sciences, physical sciences, engineering, mathematics, and the arts. Descriptions of Syracuse University courses are not included in the following College of Environmental Science and Forestry courses.

In graduate programs at the College, Syracuse University courses are used extensively in the fields of mathematics, physics, chemistry, biology, engineering, economics, business, and citizenship. The State University Upstate Medical Center has courses available for graduate programs in the areas of anatomy, biochemistry, cytology, microbiology, and physiology.

DESCRIPTION OF COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSES

The courses offered by the College are grouped by general subject areas, and the number of credit hours appears after the course title. A credit hour means one recitation (or lecture) hour per week. Three laboratory hours are equivalent to one lecture hour.

COURSE NUMBERING SYSTEM (Effective September, 1968)

I. Code Levels:

- 000-099 Noncredit courses
- 100-199 Freshman courses
- 200-299 Sophomore courses
- 300-499 Junior & senior courses
- 500-599 Junior & senior courses which may be accepted for graduate credit at the discretion of the graduate student's major advisor, usually with the requirement of additional work to be performed.
- 600-699 Graduate courses designed primarily for the beginning graduate students but available for credit to all graduates.
- 700-899 Advanced graduate courses designed primarily for second and third year graduates and beyond, but available to all graduates.
- 900-999 Special graduate courses available only to doctoral students.

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SYRACUSE CAMPUS COURSES

APPLIED MATHEMATICS

360. INTRODUCTION TO COMPUTER PROGRAMMING

3 credit hours

The basic course in computer use offered by the College. It is intended to provide the student with the skill and understanding needed to utilize digital computer languages or problem solving. The course will cover instruction in Fortran IV, and an Assembly language plus some discussion of PL/1, Algol, APL, and use of software operating systems. This course or a demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall & Spring. Mr. C. N. Lee & Staff.

560. INFORMATION PROCESSING FUNDAMENTALS

3 credit hours

Three hours of lecture per week. The course presents problem solving and ana-

lytical structures, and practice in their application by use of a digital computer. Selected portions from the two general processing categories of numerical analysis and information systems are presented for discussion and study. The purpose is to develop an awareness with some understanding and proficiency in automated problem-solving systems. Fall. Mr. C. N. Lee & Staff.

Prerequisites: Integral calculus and proficiency in computer programming.

571. INTRODUCTION TO STATISTICAL ANALYSIS

3 credit hours

Two hours lecture and three hours lab. Elementary probability, sampling distributions, statistical estimation, hypothesis testing, inferences regarding means and variances, simple regression and correlation, and determination of sample size. Fall & Spring. Mr. Kasile.

Prerequisite: Junior or senior standing.

591. INTRODUCTION TO PROBABILITY AND STATISTICS

3 credit hours

Two hours lecture, three hours lab. Bases for application of standards of accuracy and statistical methods in forest science and technology; elementary probability in relation to the distribution of random errors and the measurement and control of these errors. Fall. Staff.

Prerequisites: Two semesters of calculus.

593. INTRODUCTION TO ANALYSIS OF VARIANCE

3 credit hours

Two hours of lecture, three hours lab. One and two-way analysis of variance, multiple comparisons, subsamples, unequal sample size, tests of hypotheses, statistical estimation, determination of sample size. Fall. Mr. Kasile.

Prerequisites: A Math 571 or A Math 591, or equivalent.

595. INTRODUCTION TO SAMPLING TECHNIQUES

3 credit hours

Two hours lecture, three hours lab. Introduction to the scientific basis of sampling: selecting an appropriate sampling unit; choosing an efficient design; calculating sampling error; determining a sample size to meet stated objectives. Spring. Staff.

Prerequisites: A Math 571 or equivalent.

719. STATISTICAL ANALYSIS

3 credit hours

Two hours lecture, three hours lab. A treatment of statistical inference, including paired design, group design, linear regression and correlation, one way analysis of variance, and some applications of chi-square. Calculation of statistics, tests of hypotheses, and proper interpretation of calculated statistics. Fall. Staff.

720. ANALYSIS OF VARIANCE

4 credit hours

Three hours of lecture and recitation, three hours of lab. Multiway classifications in the analysis of variance, with em-

phasis on the development of models, including randomized blocks, latin squares, split plots, and factorial designs with fixed effects, random effects, and mixed effects; multiple and partial regression and correlation (including curvilinear), using matrix methods; analysis of covariance, higher order contingency tables, distribution free methods, and sequential testing. Spring. Mr. Kasile.

Prerequisite: Graduate standing and an introductory course in statistics covering material through the one-way analysis of variance.

760. COMPUTER APPLICATIONS

3 credit hours

A course presenting some discussion and practice in the application of computers to the solution of complex large-scale problems. A study of simulation techniques provides the opportunity to apply a computer to the solution of problems normally considered outside the realm of classroom experience. A study of some programming systems permits the opportunity to see how computers are used to solve their own problems of efficiency concerned with time, space, and reliability. Spring. Mr. C. N. Lee.

Prerequisites: A Math 560 and A Math 591 or the equivalents.

BIOLOGY (FOREST BIOLOGY)*

301. FIELD BIOLOGY

1 credit hour

Five days of field work. A study of biotic groups in terrestrial and aquatic environment; the structure and function of natural communities; the relationship of biota to physical features of the environment. Summer Session in Field Forestry. Mr. VanDruff.

Prerequisite: A year course in biology or equivalent.

320. GENERAL ECOLOGY

3 credit hours

Two hours lecture, three hours of field trips during first half of the semester. Three hours lecture during second half of the semester. Introduction to ecosys-

*See also listings for Forest Botany, Forest Entomology and Forest Zoology.

tem ecology stressing the dynamic interrelationships of plant and animal communities with their environments, ecological factors, energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, biogeography, and representative ecosystems. The ecological impact of man is reviewed. Fall. Mr. Alexander.

Prerequisite: A year course in biology or equivalent.

330. PRINCIPLES OF GENERAL PHYSIOLOGY

3 credit hours

Three hours of lectures. Introduction to the dynamics of living systems with emphasis on the universality of the biological world. Fall. Mr. Brezner.

Prerequisite: One semester of organic chemistry.

497. UNDERGRADUATE SEMINAR

1 credit hour

Literature surveys and seminars on topics of biological interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Spring and Fall. Staff.

498. RESEARCH PROBLEM IN BIOLOGY

1-3 credit hours

Independent research in topics in Forest Biology for the superior undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions, and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

515. ADVANCED LIMNOLOGY

4 credit hours

Note: SUNY, Albany No. BIO 516

Eight weeks, two full days/week. Comprehensive analysis of primary and secondary producers in a selected series of Adirondack lakes and streams. Lecture discussion sessions to serve to direct individual student projects detailing the flow of energy and circulation of matter in a variety of mountain habitats. Sum-

mer Session I & II, Cranberry Lake Biological Station. Mr. McNaught, SUNYA.

Prerequisite: Bio 202, 12 hours of biology.

521. ECOLOGY OF FRESHWATERS

2 credit hours

Note: SUNY, Albany No. BIO 421

Two full days/week for four weeks. Experimental and observational studies of environmental and biotic interactions, influencing productivity of freshwaters. Basic concepts at the organismic, population, and community level. Summer Session I, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: A course in ecology.

540. CHEMICAL ECOLOGY

3 credit hours

Two hours of lecture and one hour of discussion. A treatment of biological phenomena incorporating elements of ecology, physiology, and chemistry as a basis for development and behavior and survival. Emphasis is on intra- and interspecific relationships involving chemical messengers at the organismal population and community levels. Spring. Mr. Simeone.

Prerequisites: Organic chemistry, general ecology, general physiology.

571. FUNDAMENTALS OF GENETICS

3 credit hours

Three hours of lecture. A general course in genetics covering the inheritance and analysis of Mendelian and quantitative traits; the chemical nature, function, and activity of the gene in cells and development; population genetics, and evolution; and the applications of genetics in animal and plant breeding. Fall. Mr. Valentine.

Prerequisites: F Bot 100, F Zool 100, or equivalent courses.

572. FUNDAMENTALS OF GENETICS LABORATORY

1 credit hour

Breeding experiments with plants and animals demonstrate basic principles of inheritance and changes in populations

caused by major forces in evolution or by breeding procedures. Methods and procedures for utilizing bacteria, fungi and higher plants and animals in genetic experiments are included. Fall Mr. Valentine.

Corequisite: F Biol 571 or equivalent course.

575. EVOLUTIONARY GENETICS

3 credit hours

Note: Syracuse University No. BIO 545

Three hours of lecture. Principles of evolution and the role of factors causing population changes, such as selection, breeding system, mutation, population size and structure, migration, and genetic drift, are discussed. Theoretical population genetics models and experimental population studies are related to evolutionary theory and studies of natural populations. Species formation and the evolution of isolating mechanisms are considered. Spring (even calendar years). Mr. Valentine and Mr. Drugar.

Prerequisite: F Biol 571, or permission of the instructor.

576. LABORATORY IN EVOLUTIONARY GENETICS

1 credit hour

Note: Syracuse University No. BIO 546

Three hours of laboratory. Techniques and procedures for population studies and their application in experimental population genetics and in the analyses of natural populations. Spring (even calendar years). Mr. Valentine and Mr. Drugar.

Corequisite: F Biol 575.

720. PHYSIOLOGICAL ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 519

Two full days per week for four weeks. Studies of selected plant and animal adaptations to both natural and modified habitats. A physiological approach to understanding the unusual plasticity of plant and animal systems to environmental changes. Summer Session II, Cranberry Lake Biological Station.

721. POPULATION DYNAMICS

2 credit hours

Note: SUNY, Albany No. BIO 518

Two full days per week for four weeks. Interrelationships of biotic and environmental factors that control population responses and interactions. Summer Session II, Cranberry Lake Biological Station.

722. BIOCLIMATOLOGY

2 credit hours

Note: SUNY, Albany No. ATM 513

Two full days/week, for four weeks. Principles of climatology and meteorology as they relate to studies of the biosphere. Emphasis is upon ecologic problems and microclimatic techniques related to forestry, agriculture, and industry. Summer Session II, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: Consent of instructor.

785. HISTOCHEMICAL TECHNIQUES

3 credit hours

One lecture and two labs. The techniques of the microtomecryostat, freeze-drying, and freeze substitution, histochemical stains, and autoradiography in the elucidation of the constitution of cells and tissues. Spring (even calendar years). Mr. Tepper.

Prerequisites: Microtechnique and organic chemistry.

835. MEMBRANES AND BIOLOGICAL TRANSPORT

3 credit hours

Two hours of lecture and one hour of discussion. Composition, structure, and physical properties of membranes. Membrane functions including transport, bioelectricity, and cell compartmentalization. Specific transport processes in biological systems. Fall (alternate years). Mr. Schaedle.

Prerequisites: One semester of biochemistry and an advanced physiology course, or permission of the instructor.

997. BIOLOGY SEMINAR

1 credit hour

One hour of lecture-discussion per week. The course emphasizes current concepts and developments in biology. Fall and/or Spring. Staff.

BOTANY (FOREST BOTANY AND PATHOLOGY) *

100. GENERAL BOTANY

4 credit hours

Prerequisite to all other courses in Botany. Two hours of lecture and four hours of lecture-laboratory in the Auto-tutorial Learning Center. An introduction to plant biology with special emphasis on the structure and function of the green plant. Fall. Mr. Geis.

210. DENDROLOGY I

2 credit hours

One hour lecture and one three-hour laboratory/field trip each week. Field study, identification, taxonomy, and elementary silvics of important forest trees of North America. Fall. Mr. Ketchledge.

310. CLASSIFICATION OF THE PLANT KINGDOM

3 credit hours

Two hours of lecture and three hours of lab. Introductory study of the Plant Kingdom with emphasis on the angiosperms. Spring. Mrs. Wang and Staff.

330. PLANT PHYSIOLOGY

2 credit hours

Two hours of lectures. Descriptive aspects of the fundamental activities of plants. Subjects to be covered include cell structure, water and mineral metabolism, organic nutrition and a brief introduction to biological control mechanisms. Will not satisfy the plant physiology requirement of botany majors. Fall. Mr. Schaedle.

Prerequisite: F Bot 100 or equivalent.

360. FOREST AND SHADE TREE PATHOLOGY

3 credit hours

Two hours of lecture and three hours of laboratory. Major diseases of forest, shade, and ornamental trees and deterioration of forest products will be discussed with emphasis on disease identification, principles of disease development, effects of disease on the host, and practical control measures. Spring. Mr. Silverborg and Mr. Manion.

*See also listings for Forestry Biology.

410. DENDROLOGY II

1 credit hour

One three-hour field trip/laboratory each week. A continuation of DENDROLOGY I emphasizing trees and shrubs ecologically important in the central New York region and economically important in North America. Fall. Mr. Ketchledge.

510. MYCOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Fundamentals of the morphology, taxonomy, cytology, life histories and ecology of fungi. Laboratory experience in culturing and identification of fungi. Fall. Mr. Griffin.

515. SYSTEMATIC BOTANY

2 or 3 credit hours

Two hours of lecture, three hours of laboratory. Identification, nomenclature and classification of flowering plants with special emphasis on local flora and on developing the ability to classify the plants of any region. Spring.

Prerequisite: F. Bot 310 or permission of the instructor.

517. ADIRONDACK FLORA

1-2 credit hours

Note: SUNY, Albany No. BIO 517

One day a week for four/eight weeks. Cranberry Lake Biological Station. Field study of the summer flora of the Adirondack Mountains. Sessions I and/or II. Mr. Baum.

Prerequisite: An elementary course in systematic botany.

522. ECOLOGY OF FOREST COMMUNITIES

2 credit hours

Note: SUNY, Albany No. BIO 422

Cranberry Biological Station. Session II. Two full days per week for four weeks. Study of the structural and functional characteristics of selected Adirondack forest ecosystems; techniques of vegetational and environmental analysis. Special requirement: students must be prepared to go on two overnight camping trips to an isolated study area. Mr. Ketchledge.

Prerequisites: At least one semester of

general ecology plus 15 hours of other biological sciences.

525. FOREST ECOLOGY

3 credit hours

Two hours of lecture/discussion; one laboratory/field trip; one weekend field trip. An advanced course stressing current research in forest dynamics, vegetational development, ecological methods, and phytosociology. Spring. Mr. Geis.

Prerequisites: F Bot 210; F Biol 320 or Silvi 521.

527. BRYOECOLOGY

2 credit hours

Two full days a week for four weeks. Field and laboratory work at the Biology Station. Study of the bryoflora of the major ecosystems of the Adirondack Mountain region. Summer Session I, Cranberry Lake Biology Station. Mr. Ketchledge.

Prerequisites: Survey of the plant kingdom; systematic botany; general ecology.

Special requirement: Students must be prepared to go on two overnight trips to isolated areas.

530. PLANT PHYSIOLOGY

2 credit hours

Two hours of lecture. Internal processes and conditions in higher plants with emphasis on physiological and biochemical concepts. For students majoring in the biological sciences. Spring. Mr. Wilcox.

Note: Botany majors electing this course for their concentration must also take F Bot 531.

531. PLANT PHYSIOLOGY LABORATORY

2 credit hours

Two lab sessions. Introduction to current methods and procedures of physiological research including nutrition, tissue culture, photosynthesis, respiration, and hormonal regulation of growth. Spring. Mr. Schaedle.

Prerequisites: F Bio 330, corequisite F Bot 530, or permission of the instructor. Advance tentative registration with the instructor is required.

561. PRINCIPLES OF FOREST PATHOLOGY

3 credit hours

Three hours of lecture discussion. Concepts and principles of tree diseases in relation to forest practice. Fall. Mr. Manion.

Prerequisite: F Bot 360 or consent of instructor.

562. WOOD DETERIORATION BY MICROORGANISMS

3 credit hours

Two hours of lecture, three hours of laboratory/field trip. Major types of fungus defects of wood and its products and principles of control. Special emphasis on chemistry of wood decay, wood durability, toxicants, lumber discolorations, heartrots, and decay in forest products. Fall. Mr. Silverborg.

Prerequisite: Organic chemistry, F Bot 360, or consent of instructor. Course offered in even calendar years.

585. PLANT ANATOMY

3 credit hours

Two hours of lecture, three hours of laboratory. An introductory course in plant anatomy designed to familiarize the student with the organization and development of the primary and secondary plant body of higher plants. Spring. Mr. Tepper.

Prerequisite: F Bot 100.

630. FUNGUS PHYSIOLOGY

3 credit hours

Two hours of lecture, one hour of discussion. Principles of growth, reproduction and differentiation of the fungi emphasizing the role of the environment in controlling fungal processes. Spring (even years beginning in 1970). Mr. Griffin.

Prerequisites: Two semesters of physiology or biochemistry.

660. PHYTOPATHOLOGY

3 credit hours

Two two-hour discussions. Principles and concepts of plant pathology. Major diseases of ornamental plants, vegetable crops, fruit crops, field crops, and trees. Spring (odd numbered years).

Prerequisites: F Bot 510 and a course in plant pathology, or permission of the instructor.

715. ADVANCED SYSTEMATIC
BOTANY

2 or 3 credit hours

Lectures and laboratory. Field trips. Advanced study in the identification, nomenclature, and classification of flowering plants. Special emphasis on Gymnospermae, Compositae, and Gramineae. Fall.

Prerequisite: F Bot 515 or equivalent.

733. TECHNIQUES IN PLANT
PHYSIOLOGY

2-4 credit hours

Comprehensive study of techniques essential for research in plant physiology. Students may choose the instructors they wish to work with, and should consult the instructors for further details. Fall of every year. May be repeated for credit in different specialties. Staff.

Prerequisites: F Bot 530 and 531 or an equivalent physiology course, biochemistry with laboratory, or consent of the instructor.

761. TOPICS IN
PHYTOPATHOLOGY

3 credit hours

Two two-hour lecture-discussions. Discussions of specific phytopathological subjects. Topic selection is based on availability of expertise and will be announced in advance. Fall or Spring. Staff. This course may be repeated for credit in different specialties.

797. BOTANY SEMINAR

1 credit hour

Seminar discussions of subjects of interest and importance to the biology of plants. Fall and Spring. Staff.

798. RESEARCH IN FOREST
BOTANY

*Credit hours arranged according
to nature of problem*

Advanced study in research problems in forest pathology, wood deterioration, tree physiology, anatomy, mycology, ecology, taxonomy, and genetics. Type-written report required. Fall and Spring. Staff.

810. ADVANCED MYCOLOGY,
HOMOBASIDIOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Fall. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in odd calendar years.

811. ADVANCED MYCOLOGY,
HETEROBASIDIOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Spring. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in even calendar years.

812. ADVANCED MYCOLOGY,
ASCOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Fall. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in even calendar years.

813. ADVANCED MYCOLOGY,
MYXOMYCETES,
PHYCOMYCETES, FUNGI
IMPERFECTI

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Spring. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in odd calendar years.

830. PHYSIOLOGY OF GROWTH
AND DEVELOPMENT

2 credit hours

Lecture. A study of the growth and development of plants and the physiological and biochemical processes that influence the development of form and structure in higher plants. Fall (even years). Mr. Wilcox.

Prerequisites: F Bot 530, 585, and organic chemistry or permission of instructor.

870. POPULATION GENETICS

3 credit hours

Three hours of lecture. The principles and theorems of population genetics based upon gene frequencies and genetic effects in theoretical populations. Effects of inbreeding, selection, mutation, fitness, migration, and other factors are considered. Composition and changes in natural and laboratory populations are related to genetic theory. Spring (even numbered years). Mr. Valentine.

Prerequisites: F Biol 571, 572, one semester of calculus, A Math 720, or permission of instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

CHEMISTRY (FOREST CHEMISTRY)

221. ORGANIC CHEMISTRY I

3 credit hours

Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with an emphasis on structure, nomenclature and fundamental reactivity and other important properties, uses, and characteristics. Fall. Mr. Silverstein and Staff.

Prerequisite: One year of freshman chemistry.

222. ORGANIC CHEMISTRY LABORATORY I

1 credit hour

One three-hour laboratory period. Laboratory techniques in organic chemistry. Melting points, distillation, recrystallization, extraction, column and thin layer chromatography. Qualitative functional group analysis. Fall. Staff and laboratory assistants.

Prerequisite: One year of freshman chemistry.

223. ORGANIC CHEMISTRY II

3 credit hours

Two hours of lecture, one hour of recitation. A study in depth of the reactivity characteristics of the various classes of carbon compounds. The relation of chemical reactivity and physical properties to electronic and three dimensional characteristics of carbon compounds. Spring. Mr. LaLonde and Staff.

Prerequisites: One year of freshman chemistry and one semester of organic chemistry.

224. ORGANIC CHEMISTRY LABORATORY II

1 credit hour

One three-hour laboratory period. Continuation of F Chem 222. Simple physical, quantitative and instrumental techniques applied to organic chemistry. Gas chromatography, polarimetry, kinetics. Introduction to synthesis. Spring. Staff and laboratory assistants.

Prerequisite: F Chem 222 or equivalent.

325. ORGANIC CHEMISTRY III

3 credit hours

Two hours of lecture, one three-hour laboratory period. Classical and recent literature synthesis of organic compounds, employing advanced techniques. Fall. Mr. LaLonde.

Prerequisite: Two semesters of elementary organic chemistry.

495. INTRODUCTION TO PROFESSIONAL CHEMISTRY

2 credit hours

Professional ethics and responsibilities of the practicing chemist. Employer-employee relations, legal and legislative relations. Alternate employment opportunities. Professional organizations. Safety in the laboratory. Organization and use of chemical literature. Selection of research topic and literature survey. Fall. Mr. Schuerch and Staff.

Prerequisite: Upper division status. Senior status preferred.

496. SPECIAL PROBLEMS IN CHEMISTRY

1-3 credit hours

An opportunity for a special problem, technique development, independent or

unstructured study in an area related to the chemical profession. The work may be technical, professional, or interdisciplinary. Advisors outside this department may be solicited. A brief proposal must be presented for approval with specific arrangements outlined including faculty advisor and objectives of the study. Evidence of competence and appropriate effort is required for credit. A written report will usually be expected. Fall and Spring. Staff.

Prerequisite: Upper division status.

497. UNDERGRADUATE SEMINAR .. 1 credit hour

One hour per week. Literature surveys and seminars on topics of current research interest and recent advances in Chemistry. Spring. Staff.

498. INTRODUCTION TO RESEARCH 5 credit hours

Eighteen hours of laboratory per week, library search and report writing. Solution of a selected research problem using special laboratory techniques. Typewritten report on data, procedures, results and conclusions. Spring. Staff.

520. NUCLEAR AND RADIATION CHEMISTRY 2 credit hours

The two one-hour lectures will cover the information required for the basic understanding of nuclear reactions, the types of radiation emitted, the instrumentation necessary to detect and measure this radiation, the principles of radioisotope tracer techniques, and radiation chemistry which is the effect of radiation on organic systems. Visits to the Cornell Reactor and the Nuclear Medicine Department of the Upstate Medical Center will be arranged. Spring. Mr. Meyer.

Prerequisites: Physical, organic, and inorganic chemistry or by permission of the instructor.

Note: This course can be taken independently of F Chem 521.

521. NUCLEAR CHEMICAL TECHNIQUES 1 credit hour

The laboratory will consist of one four-hour laboratory class every two

weeks, with one hour to be made up at the student's discretion to accommodate counting periods which extend over several weeks. A short movie by the AEC each week will be required for the sixth hour. The laboratory will give each student the opportunity to use the individual counting instruments, gain experience in the handling and preparation of radioactive samples and the use of the 1000 Curie cobalt source in radiation chemistry. Spring. Mr. Meyer.

Prerequisites: Physical, organic and inorganic chemistry or permission of the instructor. Advance tentative registration is required.

Corequisite: F Chem 520.

530. BIOCHEMISTRY I 3 credit hours

Three hours of lecture. General biochemistry with emphasis on cellular constituents and metabolic reactions. The chemical, physical, and biological properties of amino acids, proteins, carbohydrates, and their intermediary metabolism will be discussed. The chemistry of enzymes, energy transfers, and biological oxidations will also be covered. Fall. Mr. Sondheimer and Mr. Walton.

Prerequisite: One year of organic chemistry.

Pre- or corequisite: One year of physical chemistry.

531. BIOCHEMISTRY LABORATORY 2 credit hours

Six hours of laboratory. This course will stress techniques used in biochemical research. Techniques used include various types of chromatography, electrophoresis, and spectrophotometry, and methods involved in the isolation, purification, and assay of enzymes. Fall. Mr. Walton.

Prerequisite: One semester of quantitative analysis with laboratory.

532. BIOCHEMISTRY II 3 credit hours

Three hours of lecture. Topics discussed are: application of tracer techniques to biochemistry, the chemical and biochemical properties of lipids, theories on the origin of life, photosynthesis and the biosynthesis of steroids and terpenes, plant aromatics, amino acids, porphyrins,

and other aspects of nitrogen metabolism. Spring. Mr. Sondheimer.

Prerequisites: F Chem 530 and its pre- and corequisites.

539. PRINCIPLES OF BIOLOGICAL CHEMISTRY

3 credit hours

Three hours of lecture. Principles of biochemistry with emphasis on their relationship to biology. Topics include basic metabolic pathways, structure and function of proteins, enzymes, and nucleic acids, energy relationships, and biochemical control mechanisms. Fall. Mr. Walton.

Prerequisite: A two-semester course in organic chemistry is desirable, but a one-semester course is acceptable. This course is not open to Forest Chemistry majors.

540. CHEMICAL ECOLOGY

This course is the same as F Biol 540. Refer to description on page 118.

550. INTRODUCTION TO POLYMER CHEMISTRY I

3 credit hours

Three hours of lecture. Mechanism and kinetics of condensation and addition polymerization. Stereochemistry of macromolecules. Chain conformation and polymer solution theory. Methods of molecular weight determination. Fall. Mr. Smid.

Prerequisites: One year of organic and physical chemistry.

551. POLYMER TECHNIQUES

2 credit hours

One hour of lecture-discussion and three hours of laboratory; lab reports. Techniques of polymer preparation: free radical solution and emulsion polymerization, copolymerization. Molecular weight determination by light scattering, osmometry, viscosity, ultracentrifugation. Structure characterization by X-ray diffraction, electron microscopy, nuclear magnetic resonance, optical rotatory dispersion, polarized microscopy, stress-strain and swelling equilibrium. Fall. Mr. Sarko.

Prerequisites: One year of organic and one year of physical chemistry. Concurrent F Chem 550 recommended.

552. INTRODUCTION TO POLYMER CHEMISTRY II

3 credit hours

Three hours of lecture. Theory of gelation and network formation. Rubber elasticity, the glassy state and glass transition temperature, the crystalline state and crystallization kinetics, characterization of structure of solid states. Manufacturing and fabrication processes for films, fibers, and plastics. Physical properties and their relation to end use. Spring. Mr. Sarko.

Prerequisites: One year organic and physical chemistry, F Chem 550 recommended.

556. POLYMER PROPERTIES

3 credit hours

Three hours of lecture. Introduction to the physical chemistry of polymers. Includes a description and classification of polymers, crystallization, glass transition, statistics of macromolecules, rubber elasticity, visco-elasticity, polymer solutions, phase equilibria, viscosity, properties of fibers, films, foams, composites. Electrical and optical properties of polymers. Fall. Mr. Smith.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

575. WOOD CHEMISTRY I

2 credit hours

Four hours of lecture first half of semester. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Wood extractives. Bark chemistry. Distribution of the cell wall constituents in wood. Fall. Mr. Timell.

Prerequisites: F Chem 221-224 or equivalent.

576. WOOD CHEMISTRY II

2 credit hours

Four hours of lecture second half of semester. Interaction of cellulose with water and alkali. Effect of acids on cellulose, hemicelluloses, and lignin. Sulfonation and oxidation of lignin. Action of alkali on cellulose, hemicelluloses, and lignin. Topochemistry of the major wood delignification reactions. Wood defects. Chemical by-products from wood. Manufacture of cellulose acetate and rayon. Fall. Mr. Timell.

Prerequisite: F Chem 575.

577. WOOD CHEMISTRY III

2 credit hours

Two hours of lecture. Chemistry of starch, pectin, and callose. Biosynthesis of cellulose, hemicelluloses, starch, pectin, callose, and lignin. Chemistry of the cambium and formation of xylem and phloem. Lignification. Earlywood, latewood, juvenile wood, and reaction wood. Aging and chemistry of the biodegradation of wood. Spring. Mr. Timell.

Prerequisite: F Chem 575.

578. WOOD CHEMISTRY LABORATORY

1 credit hour

One three-hour laboratory period. Wood analyses. Isolation of holocellulose and xylan. Proof of structure of cellulose. Preparation of carboxymethylcellulose. Characterization of wood polysaccharides by chromatographic techniques. Fall. Mr. Timell.

Prerequisites: F Chem 221-224 or equivalent.

584. SPECTROMETRIC IDENTIFICATION OF ORGANIC COMPOUNDS

1-2 credit hours

Two hours of lecture and discussion. The first half semester (1 credit) will deal with common classes of organic compounds; the second half semester (1 credit) will deal with more complex structures. The use of complementary information from mass, infrared, nuclear magnetic resonance, and ultraviolet spectrometry will be applied to identification of organic natural products. Fall or Spring. Mr. Silverstein.

Prerequisites: Organic chemistry; one semester of advanced organic for second credit.

796. SPECIAL TOPICS IN CHEMISTRY

*1-3 credit hours arranged
according to nature of topic*

Lectures, conferences, and discussion. Advanced topics in physical chemistry, organic chemistry, or biochemistry. Fall and Spring. Staff.

798. RESEARCH IN CHEMISTRY

*Credit hours arranged
according to nature of problem*

Independent research in physical and organic chemistry of synthetic polymers, physical and organic chemistry of natural polymers, organic chemistry of natural products, ecological chemistry, and biochemistry. One typewritten report required. Fall and Spring. Staff.

830. TOPICS IN PLANT BIOCHEMISTRY

3 credit hours

Three hours lecture and discussion. Covers topics in biochemistry unique to plants, including photosynthesis, biosynthesis of cellwall components, phenolics, terpenes, nitrogen metabolism, structure and function of plant hormones, biochemistry of differentiation and growth regulatory mechanisms. Spring (alternate years). Mr. Walton.

Prerequisite: F Chem 530, F Chem 532, or equivalents.

850. ORGANIC CHEMISTRY OF POLYMERS

3 credit hours

Three hours of lecture, discussion and recitation. A broad survey of polymer forming reactions and polymeric structures. Special problems in stereochemistry, polymerization mechanisms, and the synthesis of a variety of specialty polymers. Some relations between molecular structure and useful properties. Spring. Mr. Caluwe.

Prerequisites: One year of organic chemistry and F Chem 550.

855. PHYSICAL CHEMISTRY OF POLYMERS

3 credit hours

Three hours of lecture and discussion. Introduction to statistical mechanics of polymers: general problem of random flight, chain statistics and conformations, partition functions: network statistics and rubber elasticity, birefringence, swelling, crystallization. Scattering phenomena: theory of light scattering, scattering from a sphere, scattering from liquids and solids, anisotropic scattering, X-ray

scattering. Fall or Spring. Mr. Sarko and Mr. Smith.

Prerequisites: F Chem 550 and 552 (or equivalent), Chemistry 656.

884. ORGANIC NATURAL PRODUCTS CHEMISTRY

3 credit hours

Three hours lecture. The chemistry of terpenoids, steroids and alkaloids with an emphasis on the determination of structure by both modern instrumental methods and chemical degradation. Biogenetic considerations and the confirmation of structure by synthesis are covered. Fall or Spring. Mr. LaLonde.

Prerequisite: One semester of advanced organic chemistry.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

997. SEMINAR

1 credit hour

Seminars scheduled weekly; an average of twenty to thirty seminars are given annually. Discussion of recent advances in chemistry. Credit is given only once to a student. Fall and Spring. Mr. Smith.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

ECONOMICS (FORESTRY ECONOMICS)

290. INTRODUCTION TO ECONOMICS FOR FORESTRY

3 credit hours

Three hours of lecture and discussion. Population and resources. Trends in the American economy. Supply and demand. Theory of the firm and industry. Composition, measurement, and determination of national income. Monetary and fiscal policies. The roles of government, business and labor. Comparative economic systems. General economic principles are stressed. Spring. Mr. Petriceks.

300. INTRODUCTION TO MACROECONOMICS

3 credit hours

Three hours of lecture and discussion. Composition, measurement, and determination of national income. Financial institutions of the United States. Monetary and fiscal policies. The Theory of Economic Growth and problems in attaining adequate levels of economic growth. Spring. Mr. Bennett and Staff.

301. INTRODUCTION TO MICROECONOMICS

3 credit hours

Three hours of lecture and discussion. Pricing and resource allocation. Supply and demand. Theory of the firm and industry. The role of labor unions in the American economy. Problems in antitrust policy. The Theory of International Trade. Fall. Mr. Bennett and Staff.

496. SPECIAL TOPICS IN RESOURCE ECONOMICS

1-3 credit hours

Guided readings, lectures, and tutorial conferences for the undergraduate student from any school of the College, designed to help him apply economic analysis to questions within his area of interest. Illustrative topics include the economics of land use and planning; of forest culture; of outdoor recreation; of water or timber management, or related resource production; of wood-using industry; and of the distribution or consumption of forest resources. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

510. PRINCIPLES OF FORESTRY ECONOMICS

3 credit hours

Two hours of lecture, three hours of laboratory. Economics of the production of forest goods and services. Land, labor, and capital and their combination in forest production. Supply and demand of various forest products and their changes over time. Economics of taxation and public policy formation. Emphasis is placed upon principles and methods of analysis useful in understanding and in making resource management decisions. Fall. Mr. Christiansen.

Prerequisite: F. Econ 301 or equivalent.

511. ECONOMICS OF THE FOREST BUSINESS

3 credit hours

Two hours of lecture, three hours of laboratory. Economic evaluation of alternative uses of land, labor, and capital in the operation of forest properties and related marketing and processing enterprises. Emphasis is on application of principles and methods of economic analysis. Part of the term is spent in appraising a forest property and preparing a plan for its operation. Complementary to instruction in F Mgt 556. Spring. Mr. Christiansen.

Prerequisite: F Econ 510 or permission of the instructor.

520. ECONOMICS OF WOOD-USING INDUSTRIES

3 credit hours

Three hours of lecture and discussion. Structure and organization of selected wood-using industries. Analysis of decision making by the firm. Principles of production and marketing including demand and cost analysis and pricing. Special issues and current problems of the industries, and introduction to the newer mathematical and statistical tools for meeting them. Spring. Mr. Armstrong.

Prerequisite: F Econ 290 or equivalent.

550. FORESTRY AND ECONOMIC DEVELOPMENT

3 credit hours

Three hours of lecture and discussion. Study of the role of forest resources in the process of economic development. Characteristics of forest resources which are important for economic development are analyzed in detail. Interrelationships between biological, technological, and institutional factors are stressed. Fall. Mr. Petriceks. Offered to seniors and graduate students in environmental and resources management. Open to others by permission of instructor.

Prerequisite: F Econ 510 or its equivalent.

570. ECONOMICS OF OUTDOOR RECREATION

3 credit hours

Group discussion, lectures, guided reading, and student essays on the eco-

nomic aspects of outdoor recreation. Major topics include: supply and demand for outdoor recreation; theories of value and choice for both recreationists and recreation-resource managers; the role of outdoor recreation in economic development; and application of economic analysis to recreation planning and public policy issues. Spring. Mr. Canham.

Prerequisites: F Econ 290 or 301, or equivalent; F Mgt 572 recommended.

710. ADVANCED PRINCIPLES OF FORESTRY ECONOMICS I

3 credit hours

Two hours of lecture, two hours of discussion. Intensive study of the micro-economics of forestry. Offered only to graduate students. Fall. Staff.

711. ADVANCED PRINCIPLES OF FORESTRY ECONOMICS II

3 credit hours

Two hours of lecture, two hours of discussion. Intensive study of the macro-economics of forestry. Offered only to graduate students. Spring. Staff.

796. SELECTED TOPICS IN THE ECONOMICS OF FORESTRY

Credit hours to be arranged

Study of a topic in forestry economics, with emphasis on wide reading, original thinking, and analytical writing. Fall and Spring. Staff.

797. SEMINAR

1-3 credit hours

Group discussion and individual conference. Critical examination of economic ideas and policies in forestry. Topics of interest to the group are selected for study, such as current developments in analytical method or in economy policy, the economic problems of small business in forestry, national or world requirements for the goods and services of the forest, or the economy of a forest region. Primarily for graduate students in forestry economics and world forestry. Fall and Spring. Staff.

800. HISTORY OF ECONOMIC THOUGHT IN FORESTRY

3 credit hours

Three hours of discussion or conference. Systematic study and critique of the development of the thinking of foresters and economists with respect to some segment of the subject matter of forestry economics. Review of major individual contributions to thought and the influence of leading scholars upon the thinking of others. Appraisal of the leading schools of thought. Offered only to graduate students. Fall or Spring. Mr. Bennett.

830. RESEARCH METHODS

3 credit hours

Three hours of discussion or conference. Study of the elements of research methodology and their application in identifying, analyzing, and resolving problems in forestry economics. Fall. Staff.

Prerequisite: Offered to Ph.D. candidates in Forestry Economics. Open to others by permission of instructor.

840. PROFESSIONAL WORKSHOP IN FORESTRY ECONOMICS

3 credit hours

Two hours of seminar and one three-hour laboratory each week. F Econ 840 is an internship-workshop in the interpretation of forest economics. The seminars are devoted to problems of programming, materials, instruction, testing, and evaluation. The laboratory incorporates leading a one-hour discussion group in F Econ 301, with preparation for that discussion group and with the writing of a report on the laboratory to be used in a subsequent seminar meeting. Fall. Mr. Bennett.

Prerequisites: Econ 605, Econ 606, and either F Econ 830 or permission of instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

ENGINEERING (FOREST ENGINEERING)*

300. FOREST ENGINEERING PROBLEMS

1 credit hour

One hour of lecture and discussion. An introduction to methodologies for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the entire resource environment. Fall and Spring. Staff.

Prerequisite: Junior standing in Forest Engineering.

301. PLANE AND GEODETIC SURVEYING

3 credit hours

Two hours lecture and recitation, three hours of laboratory. A treatment in depth of the principles of plane surveying, with particular emphasis on the analysis of errors, curvilinear survey, astronomical observations, and potential computer relationships. Spring. Mr. Bender.

Prerequisite: A Math 591.

310. FOREST ENGINEERING PROBLEMS

3 credit hours

Three hours of lecture and discussion. An introduction to methodologies of forest measurements for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the entire resource environment. Fall. Staff.

340. HYDROLOGY

3 credit hours

Two lectures and three hours of laboratory per week. The mechanics of water storage and dispersion; hydrostatics; stream function; velocity potential; dimensional analysis and momentum theory. The natural hydrologic cycle is studied in relationship to changes and structural controls imposed by man. Spring. Mr. Tully.

Prerequisites: Dynamics (or concurrent), Introductory Statistics.

*See also listings for Forest Management.

342. HYDRAULICS IN CONSTRUCTION

4 credit hours

Three hours of lecture, three hours of laboratory. The physical, mechanical, thermal, and hydraulic properties of fluids relevant to the construction industry. A study of solutions to hydraulic problems in contemporary construction activities. Not open for credit to forest engineering students. Spring. Staff.

Prerequisites: Physics and differential calculus.

410. STRUCTURES

4 credit hours

Three hours of lecture, three hours of laboratory. Engineering principles in the analysis, planning, design, construction, and maintenance of forest structures such as timber bridges, trusses, towers, dams, water supplies, sewage systems, and other facilities. Properties of timber, concrete, steel, and other structural materials. Fall. Mr. Tully.

Prerequisite: CIE 325 or concurrent registration.

412. PRINCIPLES OF PRODUCTION (HARVESTING)

3 credit hours

Three lectures per week. Fundamentals of harvesting wood products for optimum utilization; principles of production management, materials handling and transportation systems, inventory and cost control, product and market development utilization problems. Analysis of integrative case situations for wood-based enterprises. Fall. Mr. Palmer.

Prerequisite: F Mgt 522.

442. HYDRAULIC OPERATIONS

2 credit hours

Three hours of lecture, three hours of laboratory. A seven-week course beginning at mid-semester, which studies solutions to hydraulic problems in contemporary construction operational activities. Not open to students having previous credit for F Engr 342. Spring. Staff.

Prerequisites: Senior class standing in engineering or permission of instructor based on a background in hydraulics.

497. UNDERGRADUATE SEMINAR

1 credit hour

Literature surveys and seminars on topics of Forest Engineering interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Fall and Spring. Staff.

498. RESEARCH PROBLEM IN FOREST ENGINEERING

1-3 credit hours

Independent research in topics in Forest Engineering for the highly motivated undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions, and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

502. TERRESTRIAL GEODESY

3 credit hours

Two hours lecture and three hours laboratory. Theory and techniques of collection, reduction, and adjustment of precise geodetic measurements for leveling, triangulation, and trilateration. Fall. Mr. Bender.

Prerequisite: F Engr 301 or equivalent.

503. ASTRO-GEODESY

3 credit hours

Two hours lecture and three hours laboratory. Theory and techniques of collection, reduction, and adjustment of astronomical observations for position, direction, and time determination with emphasis on satellite geodesy. Spring. Mr. Bender.

Prerequisite: F Engr 301 or equivalent.

510. TRANSPORTATION SYSTEMS

3 credit hours

Two hours of lecture and three hours of laboratory. Interrelationships among natural features, transportation types, design, and management objectives to provide the most effective system within the given framework. Basic engineering principles in the planning location, design, construction, and maintenance of suitable transportation systems to serve various

aspects of forest resource management. Spring. Staff.

Prerequisites: F Engr 301 and F Engr 531 or equivalents.

530. SOIL MECHANICS

2 credit hours

Two hours of lecture, three hours of laboratory (9 weeks only). The physical, mechanical and hydraulic properties of cohesive and noncohesive soils. A nine-week course, concluding with specifications of engineering soils. Credit towards forest engineering degree may be granted only by the completion of additional assigned work. Fall. Mr. Tully.

Prerequisite: Senior class standing or permission of instructor.

Note: A student may not enroll in and receive credit for both F Engr 530 and F Engr 531.

531. SOIL MECHANICS FOR ENGINEERS

3 credit hours

Two hours of lecture, three hours of laboratory. The physical, mechanical, and hydraulic properties of cohesive and noncohesive soils. Application of these and other engineering principles to the design of earthen structures common to the forest environment. Fall. Mr. Tully.

Prerequisites: F Engr 340; also, CIE 325 concurrently.

Note: A student may not enroll in and receive credit for both F Engr 530 and 531.

540. HYDROLOGIC CONTROLS

3 credit hours

Three hours of lecture and discussion. A continuation of F Engr 340, emphasizing the application of hydrologic principles. Basic hydraulics of controlling structures, open channel flow, sedimentation, filtration systems, reservoirs, and water law as applied to forest and range land hydrology. Spring. Mr. Tully.

Prerequisites: F. Engr 340, F Engr 530 or F Engr 531, CIE 327, or equivalents as evaluated by the instructor.

560. THEORY OF ERRORS AND ADJUSTMENTS

3 credit hours

Two hours of lecture and three hours of laboratory. The theory of errors and

adjustment of observations oriented toward geodesy and photogrammetry. Topics include error definitions, weighted observations, method of least squares, matrix algebra in adjustments, variance-covariance matrix, the error ellipse, and the general case of adjustment. Fall or Spring. Mr. Brock.

Prerequisite: Calculus, A Math 591, or equivalent.

536. PHOTOGRAMMETRY

3 credit hours

Two hours of lecture and discussion, three hours of laboratory. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation, and unique requirements are considered. Fall and Spring. Mr. Brock.

Prerequisite: F Mgt 201 (or F Mgt 301 concurrent).

564. PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. Mathematical theory of photogrammetry including space resection, orientation and intersection. The theory and use of photogrammetric analogue computers in providing resource engineering maps. Fall. Mr. Brock.

Prerequisite: F Engr. 563 or equivalent.

566. REMOTE SENSOR INTERPRETATION

3 credit hours

Two hours of lecture, three hours of laboratory. An introduction to remote sensing technology as applied to detection and analysis of the forest environment, soil, water, climate, and vegetation, as an aid to multiple use management. Fall and/or Spring. Staff.

567. REMOTE SENSOR THEORY

3 credit hours

Two hours lecture and three hours laboratory of an in-depth coverage of the theory of remote sensing of the electromagnetic spectrum and the various methods of phase and amplitude recording. Holographic, photographic, and line scan recordings will be covered. Spring. Staff.

Prerequisite: F. Engr 563, Math 398, or equivalent.

599. FOREST ENGINEERING
PLANNING

4 credit hours

Three hours of lecture and three hours of laboratory. A synthesis of the fundamental areas of forest engineering in the planning of the physical development of the forest resources. Specific design studies will be made emphasizing the interrelationship of man, forest resources and their multiple services. These studies will lead to the development and application of planning to simulated realistic conditions. Spring. Staff.

664. TERRESTRIAL AND
NONTOPOGRAPHIC
PHOTOGRAMMETRY

3 credit hours

Two hours of lecture, three hours of laboratory per week. The theory and applications of terrestrial and nontopographic photo measurements. Photo-Theodolites, short-focus cameras, and microscopes are used and calibrated to provide meaningful quantitative data from photographs. Spring. Mr Brock.

Prerequisites: F Engr 563 and A Math 360 or equivalent.

760. ANALYTICAL
PHOTOGRAMMETRY I

3 credit hours

Two hours of lecture, three hours of laboratory per week. Mathematical theory of photogrammetry including space resection, orientation, intersection, and aerial triangulation. Fall. Mr. Brock.

Prerequisites: F Engr 563 and A Math 360 or equivalent.

761. ANALYTICAL
PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. A continuation of F Engr 760 leading to more extensive analytical solutions with frame and nonconventional photography. The distortions present in photographs are analyzed and camera and comparator calibrations are treated. Spring. Mr. Brock.

Prerequisite: F Engr 760.

762. INSTRUMENTAL
PHOTOGRAMMETRY I

3 credit hours

Two hours of lecture, three hours of laboratory. The theory and practice of extracting information from photographs with the aid of photogrammetric plotters. Fall. Mr. Brock.

Prerequisite: F Engr 563 or equivalent.

763. INSTRUMENTAL
PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. The major subjects of study are photogrammetric optics, the theory and design of optical and mechanical plotters and automatic mapping systems. Spring. Mr. Brock.

Prerequisite: F Engr 762 or permission of instructor.

797. SEMINAR

1 credit hour

Literature surveys and seminars on topics of Forest Engineering interest and importance. Subjects to be generated by faculty and students and to be announced prior to registration. Fall and Spring. Staff.

798. RESEARCH IN FOREST
ENGINEERING

Credit hours arranged according to nature of problem

Independent research topics in Forest Engineering for graduate students who desire specialized knowledge or research experience. Tutorial conferences, discussions and critiques scheduled as necessary. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral dissertation. Fall and Spring. Staff.

ENGLISH (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSES)

210. ADVANCED COMPOSITION AND LITERATURE

3 credit hours

Further development of reading and writing skills acquired in freshman English. Understanding of imaginative literature promoted through the study of selected works in American literature in their historical context. Practice in the principles and techniques of critical writing coordinated with reading assignments. Fall. Mrs. Sutton and Mr. Lalor.

211. TECHNICAL WRITING

3 credit hours

Instruction in the principles and techniques of technical writing in general; in the letter, memorandum, and report, and in the special techniques of technical writing in particular. Course work includes lectures and discussions, reading assignments in the required text and supplementary materials, and numerous written assignments including a formal report presenting the results of an investigation. Spring. Mrs. Sutton and Mr. Lalor.

215. FUNDAMENTALS OF PUBLIC SPEAKING

3 credit hours

Study of and practice in the application of the principles of good oral communication in extemporaneous person-to-group format. Students participate in information and problem-solving group discussions and prepare, deliver, listen to, and criticize informative and persuasive talks. Fall. Mr. Lalor.

ENTOMOLOGY (FOREST ENTOMOLOGY)*

300. PRINCIPLES OF FOREST ENTOMOLOGY

2 credit hours

Elements of insect classification, living requirements, and control manipulations that are prerequisite, with further study, to an understanding of insects in relation to applied aspects of forestry. One hour of lecture, three hours of laboratory/field work. Spring. Mr. Allen.

*See listings for Forest Biology.

500. ELEMENTS OF FOREST ENTOMOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory/field work. General classification of insects, morphology, physiology, ecology behavior, and basic principles of population control. Emphasis through illustration is on the role of insects in the forest environment. Fall. Mr. Simeone.

Prerequisites: F Bot 100 and F Zool 100.

502. FOREST AND SHADE TREE ENTOMOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory/field trip. Important forest and shade tree insects; detection, evaluation, prevention, and control of their damage; their relationship to silviculture and management of forests and shade trees. Spring. Mr. Lanier.

Prerequisite: F Ento 500 or F Ento 300.

504. INSECTS AFFECTING FOREST PRODUCTS

3 credit hours

Two hours of lecture and one hour of laboratory. Biology, identification, ecology of insect and wood interrelations, prevention of injury and control of insects injurious to forest products and wood in use. Spring. Mr. Simeone.

Prerequisite: F Ento 500 or F Ento 300. Exceptions with permission of instructor.

505. SURVEY OF ENTOMOLOGICAL LITERATURE AND HISTORY

1 credit hour

One hour of lecture. A survey of history of entomology and related sciences. Library techniques and literature sources are discussed with emphasis on entomological bibliography. Spring. Mr. Brezner.

550. FOREST AND AQUATIC INSECTS

2 credit hours

The forest and aquatic insects of Cranberry Lake Region and their role in these environments and habitats. Insect collection required. Summer (four-week per-

iod). Cranberry Lake Field Biology Station. Mr. Lanier.

Prerequisites: Background in botany, zoology, systematics, and ecology.

580. INSECT MORPHOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. A comparative study of the external morphology of insects emphasizing evolutionary trends, especially modifications of homologous structures. Topics of special importance include intersegmental relationships, feeding, sensory mechanisms, locomotion, and reproduction. Fall. Mr. Kurczewski.

Prerequisite: F Ento 500.

610. GENERAL INSECT TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Identification and classification of the important orders and families of insects; acquaintance with pertinent taxonomic literature and use of keys; and understanding of evolutionary principles and concepts and a knowledge of systematic theory and practice. Insect collection required. Spring. Mr. Kurczewski. (Note: May be offered in the Fall only in 1972-73).

Prerequisites: F Ento 500, F Ento 580.

620. AQUATIC ENTOMOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. The biology, ecology, and identification of fresh water insects, with emphasis on the role of aquatic insects in the hydrobiome. Fall. Mr. Brezner.

Prerequisite: F Ento 500 or its equivalent.

630. INSECT PHYSIOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Study of the life processes in insects; introduction to modern physiological instrumentation and laboratory methods. Spring. Mr. Brezner.

Prerequisite: F Biol 330.

660. TOXICOLOGY OF INSECTICIDES

3 credit hours

Two hours of lecture, three hours of laboratory. The mode and basis of action of various insecticides, phenomena of bio-transformation, selectivity, resistance, synergism and dosage-mortality relationships. Spring. Mr. Nakatsugawa.

Prerequisite: F Biol 330, or equivalent course in physiology or biochemistry.

720. POPULATION DYNAMICS OF FOREST INSECTS

3 credit hours

Two hours of lecture, one hour seminar. Interacting environmental factors which influence the relative abundance and distribution of forest insects, ecological principles as applied to problems in forest entomology, and pest management. Introduction to theories of population regulation and the study of the dynamics of forest insect populations; individual problem and seminar. Fall. Mr. Allen.

Prerequisites: F Ento 500, F Zool 520, A Math 571, or equivalents.

796. SPECIAL TOPICS IN FOREST ENTOMOLOGY

Credit hours arranged according to nature of work

Special instruction, conference, advanced study, and research projects in the fields of insect toxicology, insect physiology, taxonomy of immature insects, phases of biology and ecology of insects. Typewritten report required in some fields. Fall and Spring. Staff.

797. SEMINAR

1 credit hour

One hour of conference per week. Assigned reports and discussion of topics in entomology. Fall and Spring. Mr. Nakatsugawa and Staff.

798. RESEARCH PROBLEMS IN FOREST ENTOMOLOGY

Credit hours arranged according to nature of problem

Comprehensive report required in some projects. Fall and Spring. Staff.

810. ADVANCED INSECT TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Methods, procedures, and concepts of systematics. Examples and material will be drawn from among important groups of forest insects. Fall. Mr. Lanier.

Prerequisites: F Ento 580 and F Ento 610.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

ENVIRONMENTAL STUDIES

100. INTRODUCTION TO ENVIRONMENTAL STUDIES

3 credit hours

Lecture and discussion on the nature of man, his social, cultural, economic, and political institutions and how these condition his views of the environment. Fall. Staff.

101. HUMAN ECOLOGY

3 credit hours

Study of the principles of ecosystem structure and function developed in the context of human values and societal structures. Spring. Staff.

Prerequisite: ES 100.

497. UNDERGRADUATE SEMINAR

1 credit hour

Seminars on problems of environmental concern. The subject of the seminar will be announced prior to registration. Fall and/or Spring. Staff.

498. UNDERGRADUATE PROBLEM

1-3 credit hours

Interdisciplinary research designed to solve environmental problems. Selection of subject matter to be determined by

students in conference with the Undergraduate Environmental Studies Advisory Group. Problem analysis and programs for solution in the form of a final report required. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

GENERAL FORESTRY

032. ORIENTATION

No credit

One hour of lecture and discussion per week designed to introduce the freshman student to the College and its academic and social environs. Fall. Mr. H. Payne and Staff.

100. FOREST RESOURCES AND THE ENVIRONMENT

3 credit hours

Three hours of lecture and discussion per week dealing with forest and related resources in relation to national and world needs for forest goods and services. Particular emphasis is placed on forest resources policies, management, and use in relation to the environmental concerns of society as viewed today and in the foreseeable future. Fall. Staff.

451. WORLD FORESTRY RESOURCES: PROBLEMS AND PROSPECTS

3 credit hours

Three hours of lecture and discussion plus guided readings, pertaining to world forest resources and the problems and opportunities associated with their use and development. Major topics include: world forest resources; production and trade; principal wood-producing countries; forestry and the problems of underdevelopment; and special areas and topics of interest to world forestry. Spring. Staff.

Prerequisite: Upper division status. Senior status preferred.

502. APPLIED COMMUNICATIONS

3 credit hours

Two hours of lecture. Three hours of laboratory during first part of course. Major media production project required. Course objective is to acquaint students with the basic principles of instructional communications in the teaching-learning

process. Various media including television, motion pictures, exhibits, illustrated lectures, slide talks, newspapers, etc. are examined with emphasis on their utilization in environmental education. Also, consideration is given to instructional design for meeting predetermined learning objectives in various publics—lay and professional adult audiences, school children, etc. Spring. Mr. Hanselman and Staff.

550. RANGE MANAGEMENT

2 credit hours

Two hours of lecture. Range ecology, animal husbandry, management practices, and administrative aspects of range resources. Spring.

751. WORLD FORESTRY

3 credit hours

Three hours of lecture and discussion. World forest distribution and types; regional production and consumption of forest products; international trade in timber and related products; the role of forest resources in development; and special topics: tropical forestry, comparative forest policies and programs, forestry education, the problems of developing countries, international cooperation in forestry development, the role of the United States in world forestry, etc. Fall or Spring. Staff.

Prerequisite: Graduate status.

798. PROBLEMS IN WORLD FORESTRY

Credit hours to be arranged

Provides an opportunity for the student to pursue his study of forestry, or some phase thereof, in a global, regional, or national (United States and Canada excluded) setting, and to gain experience in original thinking and analytical writing. Fall and Spring. Staff. For graduate students, primarily in World Forestry.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

LANDSCAPE ARCHITECTURE

Graphics

181. GRAPHICS I

2 credit hours

Six hours of studio per week. Two three-hour drafting room periods. Elements of perspective, isometric, oblique, and orthographic projection. Practical applications of these principles in machine and architectural drawing, including piping, electrical, and plant layouts. Spring.

182. ART MEDIA I

1 credit hour

Three hours of studio per week. Studios, group instruction and demonstrations, individual critiques, sketching and drawing from model, from still life, and landscape drawing. Field trips. Primary emphasis on "form description" drawing skills. Also taught: visual perspective, pictorial composition, and techniques in various black and white media. Fall.

183. ART MEDIA II

1 credit hour

Three hours of studio per week. Studio assignments, group instruction, and demonstrations, individual critiques, sketching and drawing from model, from still life, and landscape drawing. Field trips. Primary emphasis on "form description" drawing skills. Also taught: visual perspective, pictorial composition, and techniques in various black and white media. Spring.

280. TECHNICAL DRAWING

1 credit hour

One three-hour drafting room period. Elements of perspective, isometric, oblique, and orthographic projection. Practice in freehand and instrument drawing. Fall.

281. LANDSCAPE ARCHITECTURAL DRAFTING

3 credit hours

One hour of lecture and six hours of studio per week. Lectures, readings, and exercises through studio assignments in graphic techniques, including freehand and instrument drawing, drafting, and lettering. Exposure to various graphic media, reproductive processes, axonometric, oblique, and orthographic projections. Perspective, architectural, and topographic drawing. Spring.

284. ART MEDIA III

1 credit hour

Three hours of studio per week. Studios, field trips, group instruction, criticism and demonstration, painting in oil, water color, and acrylics. A studio painting course in oil, watercolor, or acrylics to familiarize and develop color media skills and painting expressiveness. Fall.

Prerequisite: Graph 182 or 183, or permission of instructor.

285. ART MEDIA IV

1 credit hour

Three hours of studio per week. Laboratory-Studios, field trips, group instruction, criticism and demonstration; painting, sculpture, and other three-dimensional media. A studio course in various three-dimensional art forms and painting. Emphasis on individual experimentation and self-expression. Spatial relationships will be studied through the use of the third dimension, both from standpoint of "enclosure" and "setting." Spring.

Prerequisite: Graph 182 or 183, or permission of instructor.

382. GRAPHICS

2 credit hours

One hour of lecture and three hours of studio per week. Lectures, studio problems, and assigned reading. Study of the various graphic and three-dimensional techniques used to simulate the physical environment. Topics include multiview and perspective drawing, shades and shadows, model construction and interpretation. Fall.

Prerequisite: One semester of technical drawing or equivalent.

383. GRAPHICS

2 credit hours

One hour of lecture and three hours of studio per week. Lectures, Studio problems, and assigned reading. Study of the various graphic and three dimensional techniques used to simulate the physical environment. Topics include the development of those subject areas introduced in Graph 382, and new areas related to various graphic media, reproduction processes, computer graphics, and techniques of animation. Spring.

Prerequisite: Graph 382 or equivalent.

582. ADVANCED MEDIA

1-3 credit hours

Three hours of studio per week. Discussions, demonstrations, critiques, and individual study. Study oriented toward perception and self-expression, use and possibilities of various media, as selected by student and instructor. Fall and Spring.

Prerequisite: Prior art media training or experience, and permission of instructor.

Environmental Influences

113. INTRODUCTION TO ENVIRONMENTAL STUDIES

3 credit hours

Three hours of lecture per week. Lectures, assigned reading, movies, slides, discussion, papers. Discussion of the total spectrum of the physical environment; what man has done to adapt, alter and influence the environment in which he lives. Comparison of the environmental concerns and influences of African, Oriental, and Western civilizations. Course will focus on environmental forms, uses, and problems, with special concern for the professions, sciences and arts which deal directly with the environment. Spring.

211. GENERAL GEOGRAPHY

3 credit hours

Three hours of lectures, assigned readings, written reports per week. Discussion of basic geographic concepts and methods, explanation of the significance of man-land relationships as exemplified through the regional distribution and

spatial patterns of natural and cultural features, description of geologic processes and other physical features such as soils, climates, and natural vegetation. Not open to geography or geology majors. Spring.

311. PRINCIPLES OF LAND USE

3 credit hours

Three hours of lecture, reports, assigned readings per week. Explanation of factors which influence the use, development, and control of land. Discussion of government's role in land development and control. Detailed consideration of unique values of land, competition for the use of space, planning for better land use, introduction to planning concepts and techniques, and other topics. Spring.

470. ART HISTORY

3 credit hours

Three hours of lecture per week. Informal lectures and class discussion will emphasize and review assigned text and other readings and handout notes. Slides will be shown regularly; notebooks, reports, quizzes, and examinations. Evolutionary nature of the main cultural periods of Western man and fine art as man's selected environment will be the course emphasis. Fall.

471. HISTORY OF LANDSCAPE ARCHITECTURE

3 credit hours

Three hours of lecture per week. Informal lectures, and class discussion, notebooks, reports, assigned text, and assigned reserve shelf reading, optional text, and handout notes, weekly quizzes and exams. Slides. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where significant or influential on Western Man. Study of historical personalities as well as periods that are of environmental concern up into the modern period. Spring.

Prerequisites: Env Infl 470, or equivalent. History of Arts course.

550. FUNDAMENTALS OF CITY AND REGIONAL PLANNING

3 credit hours

Three hours of lectures, assigned readings, written reports per week. Discussion of the meaning and purposes of city and regional planning. Examination of the historical development of urban places. Explanation of the principal elements of the comprehensive planning process, including goal formulation and decision-making, social and advocacy planning, planning for community facilities, and planning administration. Discussion of the methods and objectives of city and regional planning. Fall.

Prerequisite: 5th year status or permission of instructor.

Landscape Architecture

310. ELEMENTS OF LANDSCAPE ARCHITECTURE AND ENVIRONMENTAL DESIGN FOR ARCHITECTURE STUDENTS

2 credit hours

Two hours of lectures, discussions and assigned readings per week. A successive presentation of a landscape architectural philosophy toward the physical environment and environmental design. Presentation of operational systems involved in the physical environment from technical, functional and symbolic points of view. Fall.

Prerequisite: Enrollment in School of Architecture or permission of instructor.

311. ELEMENTS OF LANDSCAPE ARCHITECTURAL PRACTICE FOR ARCHITECTURE STUDENTS

2 credit hours

Two hours of lectures, problems, and assigned readings per week. An introduction to the design elements of Landscape Architecture in contemporary application and practice. Spring.

Prerequisites: L A 310; enrollment in School of Architecture or permission of instructor.

322. BASIC DESIGN

2 credit hours

One hour of lecture and three hours of laboratory per week. Lectures, studios, criticism, quizzes, exams, reports, composing and rendering finished abstract design plates and constructions. Course presents a theory of abstract design applicable to all graphic arts, and offers studio time in which to apply theory to graphic problems. Presented are the mechanics of design, design terminology, a basis of design criticism, and experience in basic design. Fall.

324. INTRODUCTION TO LANDSCAPE ARCHITECTURE

3 credit hours

Three hours of lecture per week. Lecture, and class discussion, notebooks, reports, assigned text reading and assigned reserve shelf reading, research reading, weekly quizzes and exams, slides, movies, and guest lectures, field trips. Course describes the field of Landscape Architecture, its background, philosophy, interdisciplinary relationships, its spectrum of interest, the human needs it responds to. It is not a course in design or design theory but in the background basis for landscape design. Fall.

325. LANDSCAPE DESIGN STUDIO I

2 credit hours

Six hours of studio per week. Studio assignments, drafting, readings, discussion, and field trips. An introduction to the visual-mental concepts basic to landscape architectural design. Various abstract problems to illustrate elements of the physical environment and their effect upon man. Special attention to the spatial context of these elements and spatial sequences characteristic of the natural and man-made environments. Spring.

Prerequisites: L A 324, L A 322, or permission of instructor.

Note: Student field trip expense \$125-\$150.

343. STRUCTURAL MATERIALS AND ELEMENTS

3 credit hours

Three hours of lectures, problems and assigned reading per week. Study of the physical properties of materials and structural elements commonly used in landscape architecture. Topics include elementary statics and strength of materials, wood, metal, plastics, concrete, masonry, retaining walls, dams, foundations. Spring.

345. ELEMENTS OF SITE ENGINEERING

3 credit hours

Two hours of lectures and three hours of studio per week. Lectures, problems, drafting, modeling, and assigned reading. The study of land form and its technical expression through grading plans, sections, profiles, layout plans, and earthwork quantity computation. Principles of soil mechanics and land drainage and their application to surface and sub-surface drainage systems. Spring.

Prerequisites: F Mgt 201 and Env Inf1 211.

420. LANDSCAPE DESIGN THEORY I

2 credit hours

Two hours of lectures, discussions, critiques, and assigned readings per week. A successive presentation of data on the physical environment beginning with the macroscape of nature to the intensively humanized urban site. Principles of basic organization of land areas, composition of elements, analysis of sites and programs,



the process, purpose, and implication of the practice of design. Fall and Spring.

Prerequisite: 4th year status or permission of instructor.

422. LANDSCAPE DESIGN STUDIO II

4 credit hours

Twelve hours of studio per week. Studio problems, research, drafting, and field trips. The processes and methods of design considerations of variances upon the natural physical environment, ranging from broad regional areas to specific site concerns. Fall.

Prerequisites: L A 324, 325, 322, Graph 382, 383, or permission of instructor.

423. LANDSCAPE DESIGN STUDIO III

4 credit hours

Twelve hours of studio per week. Studio problems, research, and drafting. Interaction of cultural influences with the physical environment, with attention focusing on the resulting forms. Observations and illustrations of people and places as inputs into the design process. Spring.

Prerequisite: L A 422 or permission of instructor.

425. ORIENTATION FOR EXPERIENTIAL STUDIO

3 credit hours

Three hours lecture and recitation. Investigation and documentation of an area of specialized study to be engaged in an off-campus location. Lectures, discussion, readings, and research. Spring.

Prerequisite: Permission of instructor.

430. PLANT MATERIALS CULTURE

3 credit hours

Three hours of field study and lectures per week. Trees, shrubs, vines, and grasses. Identification; culture; common practices in pest and disease control. Fall.

Prerequisite: L A 333.

433. PLANT MATERIALS

3 credit hours

Field trips and discussion. Ornamental woody plant identification. Observation and sketches of outstanding examples of

planting design. Three weeks, Summer Session.

Prerequisite: L A 430 or permission of instructor.

440. SITE DEVELOPMENT SYSTEMS

3 credit hours

Three hours of lectures, problems and assigned reading per week. Study of various engineering systems as they relate to the design and development of land. Topics include pedestrian ways, utilities (water, solid waste, sewage, electric, gas), road location and design, shore protection, swimming pools. Fall.

Prerequisite: Surveying.

495. SELECTED READINGS IN ENVIRONMENTAL STUDIES

1-3 credit hours

Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall, Spring and Summer Session.

Prerequisite: Permission of instructor.

498. INTRODUCTORY RESEARCH PROBLEM

1 credit hour

Guided study of a selection of problems relating to landscape architecture and environmental design. Emphasis on study procedure and methods employed. Fall and Spring. Staff. Enrollment at periodic intervals throughout the semester.

Prerequisite: Permission of instructor.

522. LANDSCAPE DESIGN STUDIO IV

4 credit hours

Twelve hours of studio per week. Studio problems, research, drafting, and field trips. Concentration on complex urban problems. Concern for social and psychological considerations of the individual and large groups of people, their interaction and resultant forms of the environment. Spring.

Prerequisite: Permission of instructor.

524. EXPERIENTIAL STUDIO

16 credit hours

48 hours per week. The articulation of the study proposal established in L A 425, as approved by faculty, through research, readings, field study with graphic and written documentation, and group discussion. Academic study in an off-campus location in an area of landscape architectural significance, as described and delineated in a student-prepared proposal approved by the faculty. Not available for Graduate Credit. Fall or Spring.

Prerequisites: L A 425 or equivalent and L A 423 or permission of instructor.

525. LANDSCAPE DESIGN STUDIO V

4 credit hours

Twelve hours of studio per week. Investigation of a problem in landscape architecture as proposed by the student and conducted in conjunction with faculty advisor. Spring.

Prerequisite: L A 522 or permission of instructor.

527. LANDSCAPE DESIGN STUDIO V

4 credit hours

Twelve hours studio per week. Studio problems, research, reports, and field trips. Concentration on regional landscape problems, the techniques of their analysis and derivation of their significance to the practice of landscape design. Spring.

Prerequisite: L A 522 or permission of instructor.

530. HERBACEOUS PLANT MATERIALS

2 credit hours

Two hours of lectures, study problems, assigned readings and field trips per week. Identification, understanding, and design use of nonwoody plants. Fall.

Prerequisite: Permission of instructor.

532. WOODY PLANT MATERIALS

3 credit hours

Three hours of lecture per week. Field study, lectures, slide presentations and readings. An elective course providing opportunity for extension of basic knowledge in the identification and design of

woody plant materials in professional practice. Fall or Spring.

Prerequisites: L A 333 and L A 430 or permission of instructor.

542. HIGHWAY LOCATION AND DESIGN

3 credit hours

Two hours of lecture, three hours of studio per week. Lectures, assigned reading, studio projects, field trips. Environmental, engineering and human factors which determine highway location and design, particularly as they relate to landscape architectural concerns. Location, alignment, geometric design, drainage, roadbed construction, pavements, roadside development. Fall or Spring.

Prerequisites: L A 343, 440 and 540, or permission of instructor.

545. PROFESSIONAL PRACTICE STUDIO II

2 credit hours

Three hours of studio, one hour of recitation per week. Studio problems, research, discussion, and recitation sessions on the processes and methods of office practice. Emphasis on all aspects of site-development. Spring.

Prerequisite: L A 544 or permission of instructor.

547. PRINCIPLES OF PROFESSIONAL PRACTICE

2 credit hours

Two hours of lecture per week. Lectures, assigned readings, reports, cost estimates, specifications, contracts, professional ethics, registration laws, professional practice. Spring.

Prerequisite: Upperclass standing.

561. ECOLOGICAL ARCHITECTURE

3 credit hours

One hour of seminar, six hours of studio per week. Study of special relationships of architectural form to predominantly natural environments, particularly parks and other recreation areas. A variety of studio projects involving program preparation, preliminary design and detailed drawings. Spring.

Prerequisite: L A 560 or permission of instructor.

562. ARCHITECTURE

3 credit hours

Two hours of lecture, three hours studio. Discussion and investigation of the principles of architectural design and procedures of architectural practice. Functional building systems coupled with site and program considerations as to their relative impacts on architectural form. Spring.

Prerequisite: Permission of instructor.

595. SELECTED READINGS IN LANDSCAPE ARCHITECTURE

1-3 credit hours

Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall, Spring and Summer Session.

Prerequisite: 5th year graduate status or permission of instructor.

597. LANDSCAPE ARCHITECTURE SEMINAR

2 credit hours

Two hours of seminar per week. Discussion of current social, political, cultural, and technological problems as to their relationship to the physical environment. Fall and Spring.

Prerequisite: Permission of instructor.

598. RESEARCH PROBLEM

1-3 credit hours

Independent study of selected areas of environmental interest. Emphasis on a self-disciplined study, development of procedures and techniques to be employed in environmental design and planning. Engagement with specific sites and problems as proposed for study by individual communities. Fall and Spring. Enrollment at periodic intervals throughout the semester.

Prerequisite: Permission of instructor.

697. SEMINAR—DESIGN AND PLANNING IN THE PHYSICAL ENVIRONMENT

2 credit hours

Discussion of assigned topics selected to acquaint the entering graduate student with a generalized view of the motivation and procedures of environmental design and planning. Fall and Spring.

Prerequisite: Graduate status.

720. LANDSCAPE DESIGN V

4 credit hours

Development of a major landscape design problem involving preparation of a series of related drawings. Fall.

Prerequisites: L A 522, L A 525, or permission of instructor.

721. LANDSCAPE DESIGN VI

4 credit hours

Continuation as described above. Further advanced project design similar to the work of L A 720. Spring.

730. PLANT MATERIALS IV

2 credit hours

Lecture, field work, trips. Special study of woody and herbaceous plant materials, greenhouse operation, and other horticultural practices. Spring.

731. PLANT MATERIALS

3 credit hours

Seminars, individual conferences, field trips, readings. Guided individual study in aspects of plant materials related to landscape architecture. Fall or Spring.

Prerequisite: L A 730 or permission of instructor.

740. LANDSCAPE ARCHITECTURAL CONSTRUCTION

3 credit hours

Lectures, drafting. Detailed study of special landscape construction problems. Preparation of estimates, contracts, and specifications. Fall.

Prerequisite: L A 542.

750. CITY PLANNING

3 credit hours

Lectures, reports, assigned readings and design. Architectural, aesthetic and engineering principles. One typewritten re-

port (original and four carbons) required. Fall.

Prerequisites: L A 522, L A 525.

797. SEMINAR

2 credit hours

Discussion of miscellaneous current problems related to planning and management. Fall or Spring.

798. RESEARCH PROBLEM

Credit hours arranged according to nature of problem

Special study of assigned problems relating to landscape architecture or planning, with emphasis on critical thinking. Fall and Spring.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring.

MANAGEMENT (FOREST MANAGEMENT) *

201. PLANE SURVEYING

3 credit hours

Two hours of lecture and recitation, three hours of field or office practice. A comprehensive development of the theoretical principles of plane surveying. Use of modern instruments and methods, computations related to forest activities. Fall. Staff.

Prerequisite: Plane Trigonometry.

303. INTRODUCTION TO FOREST MEASUREMENTS (SUMMER FIELD SESSION)

1 credit hour

Introduction to the concepts and practices of elementary field measurements necessary to forest survey and stand data preparation. Emphasis is given to field procedures, methods, and instruments, and to recognition of need for standards of performance. Summer Session. Staff.

310. ROADS

3 credit hours

Two hours of lecture, three hours of field and laboratory practice. Engineer-

*See also listings for Forest Engineering.

ing principles in the planning, location, design, construction, and maintenance of forest roads. Contract specifications, costs, drainage, typical sections, grades, curves, surfacing materials, use of heavy equipment, and explosives. Principles in the location, installation, and maintenance of communications. Spring. Mr. Kotten.

Prerequisite: F Mgt 201 or F Engr 301.

340. HARVESTING

2 credit hours

Two hours of lecture. Principles of harvesting primary forest products. Equipment, methods, and economics of the logging industry. Spring. Mr. Kotten.

498. PROBLEMS IN FOREST MANAGEMENT

1-3 credit hours

Independent study in special problems in Forest Management. The selection of a subject area will be determined by the student and an appropriate faculty member designated by the Department Chairman. A final written report is required for department records. Fall and Spring. Staff.

Prerequisites: Senior standing in Resources Management and permission of instructor.

522. MENSURATION

3 credit hours

Two hours lecture and discussion, one three-hour laboratory. Principles and methods of estimating and projecting net volumes of trees and products; tree form; timber volume determination of logs, trees and stands; growth determination; analyses by graphical and mathematical methods; stand structure adjustments; numerous problems. Spring. Mr. Sullivan.

Prerequisites: A Math 571 or A Math 591; F Mgt 201 or F Engr 301

530 FOREST MANAGEMENT

4 credit hours

Three hours of lecture supplemented by one hour of discussion and/or lecture. Public and private forest policy formation; principles of modern management; over-all management and operation of a productive forest property. Primarily for forest engineers. Not available to Re-

source Management undergraduates. Spring or Fall. Mr. Koten.

Prerequisites: Mensuration and Silviculture or by permission of the instructor.

540. ANALYSIS AND CONTROL OF FORESTRY OPERATIONS

3 credit hours

Two hours of lecture, three hours laboratory. Applications of scientific methods to management decision problems of forestry operations with emphasis on data sources and reliability, model formulation, inventory control, equipment replacement, simulation, and critical path scheduling and costing. Fall. Mr. Koten.

Prerequisites: A Math 571 or equivalent, F Mgt 340 and computer programming.

552. MANAGEMENT PLANNING AND OPERATIONS

3 credit hours

Three hours of lecture and recitation. The over-all management and operation of a forest property as a productive enterprise, particularly development and expediting of cutting budgets, work plans, and operating schedules. Emphasis is on integration of principles and concepts of mensuration, silviculture, utilization, engineering, economics, administration, and human relations in the context of a practical operating land ownership. Spring. Mr. Horn.

554. FOREST ADMINISTRATION AND POLICY

3 credit hours

Three hours of lecture and recitation. Administrative and executive aspects of forestry. Public and private forest policy formulation; basic principles of organization, planning, public relations, personnel management, budget, and administrative practice. Work and organization of the major agencies engaged in forestry. Fall. Mr. Getty.

556. MANAGEMENT OF THE FOREST BUSINESS

3 credit hours

Three hours of discussion. Overview of major business management principles and methods of operation in forestry enterprises. Emphasis is on general busi-

ness concepts which forest managers must use. Actual case studies are basis of instruction. Complementary to F Econ 511. Fall or Spring. Mr. Horn.

558. THE LAW OF NATURAL RESOURCE ADMINISTRATION

3 credit hours

Three hours of lecture-discussion. An introduction to the law concerning the procedures, powers, and judicial review of public agencies responsible for the management of natural resources. Topics will include the extent of an agency's rule-making power and the rights of aggrieved parties to appeal from agency decisions. Spring. Mr. Horn.

Prerequisite: F Mgt 554 or equivalent course in public administration.

560. MANAGEMENT PRINCIPLES AND PROCESSES

3 credit hours

Three hours of lecture. The principles of the art of managing manpower, providing greater depth in the concepts of management covered in F Mgt 554. Network analysis methods of management planning. Evaluation of personnel. Human relations concepts. The processes of problems recognition and decision-making, with consideration of the philosophical and qualitative elements of management science and information theory and their implications. Spring. Staff.

Prerequisite: F Mgt 554 or permission of instructor.

561. OPERATION COST CONTROL

3 credit hours

Three hours lecture. Management uses of accounting data. Essentials of cost accounting and the uses and misuses of historical cost data in management decision-making. Concepts of financial analysis of past and projected cash flows, and various methods of comparing alternatives. Fall and Spring. Staff.

Prerequisite: Permission of instructor.

562. THE STRUCTURE OF MANAGEMENT DECISIONS

3 credit hours

Three hours of lecture. Introductory course in managerial decisionmaking.

Covers theory, concepts, and methodology of management practices and relates these to the realities of decisionmaking. Uses the problem solving approach in preparing the prospective resource manager or administrator for an understanding of the application of decisionmaking models. Spring. Staff.

Prerequisites: F Mgt 554, A Math 571 or equivalent and permission of instructor.

572. PRINCIPLES OF OUTDOOR RECREATION

3 credit hours

Three hours of lecture per week. Lectures, assigned readings, oral reports. Discussion of the importance of outdoor recreation in modern society and factors which contribute to the need for outdoor recreation. Description of types of recreational facilities and the organizations which provide them. Explanation of economic, social, and political relationships in outdoor recreation. Fall. Mr. D. Morrison.

Prerequisite: Fourth year status or permission of instructor.

575. SOCIOLOGY OF OUTDOOR RECREATION

3 credit hours

Two hours lecture, three hours laboratory. Introduction to theory and research findings dealing with the sociological aspects of outdoor recreation: field work and lectures suggest administrative applications. Spring. Mr. D. Morrison.

Prerequisite: An introductory course in sociology or psychology; instructor's permission.

710. RESEARCH METHODS

3 credit hours

Instruction regarding methodology in the approach to and solution of problems in Forest Management research. Restricted to graduate students in Forest Management. Spring. Staff.

720. TOPICS IN ADVANCED MENSURATION

3 credit hours

Two 1½ hours of lecture per week. Topics to meet students' interests are

selected from the following areas: systematic, stratified and cluster sampling; ratio and regression estimates; photo interpretation and double sampling; sampling with unequal probabilities and 3P sampling; Continuous Forest Inventory (CFI) and Sampling with Partial Replacement (SPR). Introduction to Matrix Algebra and its application to Multiple Linear Regression, Weighted Least Squares Method, Volume Table Construction, and Analysis of Covariance by dummy variables. Applications of Mathematical Programming and simulation techniques to management problems involving optimization of cost functions. Fall. Mr. Cunia.

Prerequisites: F Mgt 522 and A Math 591 or equivalent.

752. APPLIED FOREST MANAGEMENT

3 credit hours

Principles and practices of forest management as applied to specific forest properties under the guidance of responsible public and private foresters. Several days are spent in the field studying forest conditions, organizations, operations, and problems. By observing actual forest operations, students become acquainted with the latest and most efficient forest practices in office and forest. Fall. Mr. Horn.

754. ADVANCED FOREST ADMINISTRATION

3 credit hours

Critical appraisal of existing public, semi-public and private forestry agencies in the United States, and the comparative study of major administrative organizations and practices. Occasional inspection trips to forestry headquarters and field units and discussion of internal administrative problems with forest officers. Spring. Mr. Getty.

Prerequisite: F Mgt 554 or equivalent.

756. MANAGEMENT CONCEPTS IN PLANNING FOREST PRODUCTION

3 credit hours

Three hours of lecture-discussion. The theories and principles involved in planning the annual allowable cut and the

resulting yearly cutting schedules. The influence of technical decision and socioeconomic pressures upon the level of cutting and the effect of the level of cutting upon the dependent industry. Fall or Spring. Mr. Koten.

Prerequisite: F Mgt 552 or equivalent.

797. SEMINAR

1 credit hour

Group discussion and individual conference concerning current topics, trends, and research in management. Fall and Spring. Staff.

798. FOREST MANAGEMENT PROBLEMS

Credit hours arranged according to nature of problem

Hours to be arranged. Special study of assigned problems with emphasis on critical thinking. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

851. OPERATIONS RESEARCH I

3 credit hours

Two 1½ hours of lecture. Stochastic or models applicable to managerial process or systems analysis. Elements of probability theory, theory of games and decision theory, queuing model, simulation techniques with applications to queuing and inventory problems, and, if time permits, Markov chains. Fall. Mr. Cunia.

Prerequisites: A Math 591 and Math 227 or equivalent.

852. OPERATIONS RESEARCH II

3 credit hours

Two 1½ hours of lecture. Deterministic or models applicable to managerial problems or systems analysis. Elements of Matrix Algebra, solving simultaneous linear equations, mathematical programming, classical optimization techniques, LaGrange multipliers. Linear programming transportation and allocation models, dynamic programming, network analysis and, if time permits, quadratic, parametric and integer programming. Fall. Mr. Cunia. (Note: Offered in Fall of 1972-73.)

Prerequisites: A Math 591 and Math 227 or equivalent.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

MATHEMATICS (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSES)

115. PLANE TRIGONOMETRY

3 credit hours

Three hours of lecture. The course includes: the six trigonometric functions, the radian measure of angles, the variation and graphs of the trigonometric functions, the solution of right triangles and applications, trigonometric identities, trigonometric equations, inverse trigonometric functions, the general triangle, complex numbers, logarithms, and accuracy of computed results. Fall or Spring. Mr. Green.

116. COLLEGE ALGEBRA

3 credit hours

Three hours of lecture. The course includes a review of the axioms of algebra, the algebraic operations, inequalities, functions and their graphical representation, linear and quadratic functions, determinants, theory of equations, inverse functions, permutations, combinations and probability, the Binomial Theorem, mathematical induction, exponential and logarithmic functions and complex numbers. Fall or Spring. Mr. Green.

PAPER SCIENCE AND ENGINEERING

300. INTRODUCTION TO THE PULP AND PAPER INDUSTRY

1 credit hour

Discussion of the historical modern development and management of the paper industry. Fall. Mr. O'Neil.

301. PULP AND PAPER PROCESSES

3 credit hours

Three hours of lecture. Introduction to pulp and paper technology with emphasis on pulping and bleaching. A study of the processes of pulping and bleaching of fibers including underlying theory. An introduction to formation and reactions of a fibrous web. Spring. Mr. Bambacht.

Prerequisites: Chem 332, F Chem 575 and 576.

302. PAPER PROCESSES LABORATORY

1 credit hour

One three-hour laboratory. Study and practice in the techniques of laboratory procedures normally encountered in the pulp and paper industry. Laboratory exercises selecting and using standard testing methods. Field trips to observe commercial equipment of the pulp and paper industry. Spring. Mr. Bambacht.

Prerequisite: PSE 301 (or concurrent).

304. MILL EXPERIENCE

5 credit hours

Twelve weeks full-time pulp or paper mill employment approved by the Department between the junior and senior years. Ordinarily, the student receives wages or salary while getting the required experience. The student must submit a comprehensive report to fulfill this requirement. An adaptability rating chart furnished by the Department is prepared by the mill for each student employed. Staff.

305. MILL INSPECTION REPORT

1 credit hour

One week inspection trip to representative manufacturers of pulp and paper, paper-making equipment, plastics, chemicals, or related products selected for demonstrating typical plant scale operations. Ultimate emphasis is on manufacture of pulp and paper. Daily discussions. Typewritten report required on termination of trip. Trip expenses are approximately \$60 per student. Spring. Staff.

Prerequisites or concurrent: PSE 301, PSE 302, PSE 570, PSE 571, and PSE 573.

496. SPECIAL TOPICS

1-3 credit hours

Lectures, conferences, and discussions. Specialized topics in chemistry, chemical engineering, and physics as well as topics pertaining to management as related to the pulp, paper, paperboard and allied industries. Spring. Staff.

498. RESEARCH PROBLEM

4 credit hours

Twelve hours laboratory. The student is assigned a research problem in pulping, bleaching, refining, additives, quality control of paper or paper products or chemical engineering. The student must make a systematic survey of available literature on the assigned problem. Emphasis is on application of correct research technique rather than on discovery of results of commercial importance. The information obtained in the literature survey along with the data developed as a result of the investigation is assembled and evaluated and submitted in duplicate to his instructor. Spring. Staff.

Prerequisites: PSE 561, PSE 565.

556. ECONOMICS OF PULP AND PAPER

2 or 3 credit hours

Two or three hours of lecture and seminar. Structure and development of the industry and the decisions of management are explained in the light of economic principles. Current industrial trends and problems are discussed. Each student prepares an analytical report on some aspect of industry structure. Spring. Mr. Armstrong.

Prerequisite: F Econ 290 or equivalent.

561. PULPING TECHNOLOGY

4 credit hours

Two hours of lecture and six hours of laboratory. Discussion of pulping and bleaching processes: Effect of chemicals and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall. Mr. Gorbatsevich.

Prerequisites: PSE 570, Chem 346 and Chem 356.

Note: A student may not enroll in or receive credit for both PSE 561 and PSE 661.

565. PAPER PROPERTIES

5 credit hours

Three hours of lecture, six hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results, and the ultimate properties desired in the finished paper. Fall. Mr. Strauss.

Prerequisites: PSE 301, PSE 302.

Note: A student may not enroll in or receive credit for both PSE 565 and PSE 665.

566. PAPER COATING

3 credit hours

Two hours of lecture, three hours of laboratory. Evaluation and study of the various coating processes and materials used by the paper industry to impart special properties to paper. Relationships of various components, flow properties of coating mixtures, and evaluation of their effect on coated paper properties will be studied. Spring. Mr. Strauss.

Prerequisite: PSE 565.

Note: A student may not enroll in or receive credit for both PSE 566 and PSE 666.

568. PAPERMAKING PROCESSES

3 credit hours

One hour of lecture, six hours of laboratory. Laboratory study of the paper-making process, with emphasis on operation of the semi-commercial Fourdrinier paper machine. Emphasis is on the fundamentals of stock preparation, paper machine operation. evaluation of the finished product, and the collection and analysis of data to develop material and energy balance. Results of each paper machine run are evaluated in seminar-type discussions, Spring. Messrs. Strauss, Gorbatevich, and Stenuf.

Prerequisites: PSE 561, PSE 565, PSE 571.

570. PRINCIPLES OF MASS AND ENERGY BALANCE

3 credit hours

Three hours of lecture. Study of the properties of steam and solving problems connected with material and energy balances. Spring. Mr. Gorbatevich.

Prerequisites or concurrent: Math 227, Physics, Chem 346, Chem 356, and Chem 333.

572. PULP AND PAPER UNIT OPERATIONS LABORATORY I

1 credit hour

Three hours of laboratory. Laboratory study of fluid dynamics, heat transfer and evaporation. Emphasis is placed on the recognition of the important variables and on methods of evaluating them by experimentation and subsequent calculations. Specially designed semi-commercial equipment is used. Fall. Mr. Stenuf.

Concurrent: PSE 571.

574. PULP AND PAPER UNIT OPERATIONS LABORATORY II

3 credit hours

Nine hours of laboratory. Laboratory study of humidity and air conditioning, drying, extraction, distillation, gas absorption, filtration, sedimentation, mixing, and other unit operations. Emphasis is placed on the recognition of the important variables and on methods of evaluating them by experimentation and subsequent calculation. Specially designed semi-commercial equipment is used. Spring. Mr. Stenuf.

Concurrent: PSE 573.

575. UNIT OPERATIONS I: FLUID MECHANICS AND HEAT TRANSFER

3 credit hours

Three hours of lecture and four hours of recitation per week for the first 9 weeks of the semester. The study of momentum and heat transfer. Pipeline and duct design, pump and blower selection, flow measurement, open channel flow, heat transfer by conduction, convection, radiation, including equipment design and selection. Fall. Mr. Stenuf.

Prerequisites: F Chem 221 and 223, Chem 106, 116, 346, 356, Phys 103, 104, PSE 300, 301, 570 or equivalents.

576. UNIT OPERATIONS II: PROCESS CONTROL AND MASS TRANSFER

2 credit hours

Two hours of lecture and four hours of recitation per week for the last 6

weeks of the semester. The study and application of measuring means, remote signal transmission, and control elements. Response to signals, lag, dynamic error, cycling and other phenomena of process control are discussed in relation to the standard modes of control, including two-position, single-speed floating, proportional, proportional-speed floating, proportional-reset, proportional-reset-rate, cascade control, relation of the process variables to open and closed loop computer applications.

The fundamentals of mass transfer, humidification and air conditioning as applied to industry and as found in the environment—climate and weather conditions. Fall. Mr. Stenuf.

578. UNIT OPERATIONS III: MASS TRANSFER

3 credit hours

Three hours of lecture and four hours of recitation per week for the first 9 weeks of the semester. The study of mass transfer and application to the design and operation of equipment for drying, gas absorption, distillation and extraction. Each operation is treated as a practical unit complete with application of heat transfer, fluid flow, thermodynamics and instrumentation. Spring. Mr. Stenuf.

Prerequisite: PSE 576.

579. UNIT OPERATIONS IV: RECOVERY PROCESSES OPERATIONS

2 credit hours

Three hours of lecture and four hours of recitation per week for the last 6 weeks of the semester. The study of industrial recovery processes operations including evaporation, filtration, sedimentation, centrifugation, small particle technology and fluidization, and reverse osmosis. Each operation is treated as a practical unit complete with application of heat transfer, fluid flow, thermodynamics and instrumentation. Spring. Mr. Stenuf.

Prerequisite: PSE 576.

661. PULPING TECHNOLOGY

4 credit hours

Two hours of lecture and six hours of laboratory. Discussion of pulping and

bleaching processes. Effects of chemicals and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall. Mr. Gorbatshevich.

Prerequisites: PSE 570, Chem 346 and Chem 356.

Note: A student may not enroll in or receive credit for both PSE 561 and PSE 661.

665. PAPER PROPERTIES

5 credit hours

Three hours of lecture, six hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results, and the ultimate properties desired in the finished paper. Fall. Mr. Strauss.

Note: A student may not enroll in or receive credit for both PSE 565 and PSE 665.

666. PAPER COATING

3 credit hours

Two hours of lecture, three hours of laboratory. Evaluation and study of the various coating processes and materials used by the paper industry to impart special properties to paper. Relationships of various components, flow properties of coating mixtures, and evaluation of their effect on coated paper properties will be studied. Spring. Mr. Strauss.

Note: A student may not enroll in or receive credit for both PSE 566 and PSE 666.

775. INDUSTRIAL THERMODYNAMICS

3 credit hours

The study and application of thermodynamics, including the first and second law, phase relationships, thermochemistry, the production of work and equilibrium relationships. Fall. Mr. Stenuf. Course given in even calendar years.

Prerequisites: Chem 346, Chem 356, or equivalent.

**778. METALLURGY AND
CORROSION FOR THE PAPER
INDUSTRY**

3 credit hours

Three hours of lecture. The study and application of metallurgy and corrosion for the Pulp and Paper Industries. Fall. Mr. Stenuf. Course given in odd calendar years.

Prerequisites: Chem 346, Chem 356, or equivalent.

796. SPECIAL TOPICS

1-3 credit hours

Lectures, conferences, and discussions. Advanced topics in chemical engineering, chemistry and physics as related to fibers, pulps, and paper. Fall and Spring. Staff.

797. SEMINAR

1 credit hour

Discussions of assigned topics in fields related to pulp and paper technology. Fall and Spring. Staff.

**798. RESEARCH IN PULP AND
PAPER TECHNOLOGY**

*Credit hours arranged according to
nature of problem*

Hours to be arranged. Problems in pulp and paper technology are assigned to properly qualified graduate students. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

Prerequisites depend upon nature of problem.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

RESOURCES MANAGEMENT

**304. SILVICULTURE—RESOURCE
MANAGEMENT (SUMMER
FIELD SESSION)**

3 credit hours

Field exercises designed to illustrate silviculture practices applied to forest

stands, followed by a sequence of field trips, case studies and discussions introducing concepts and applications of multiple use in forestry. Consideration of the effects of ownership, forest conditions, economic factors and achieving management objectives. Summer Session Staff.

**341. SOIL AND WATER
CONSERVATION**

3 credit hours

Three lectures per week. An integrated historical survey of water and related land resource conservation in the United States. Interrelationships of planning, administration, and evaluation of policies, programs, and projects by all levels of government and private units. Spring. Mr. Black.

**497. RESOURCES MANAGEMENT
SEMINAR**

3 credit hours

Three hours of group discussion and analysis. Current literature, plans, and principles, and new developments in forest management. Fall or Spring. Staff.

502. RESOURCES MANAGEMENT

3 credit hours

The interrelationships between man and forest resources and the multiple services which those resources provide; the extent and nature of responsibilities of the forester to the community and to society in his stewardship of natural resources. Spring. Staff.

**641. SOIL AND WATER
CONSERVATION**

3 credit hours

Three hours of lecture and discussion. An integrated examination of the many aspects of the field of water and related land resource conservation in the United States. Topics include the evaluation and present status of planning, organizational, economic, and legal constraints on the development of policies and programs of the Federal agencies, state and local government, and private units. Fall. Mr. Black.

Prerequisite: Permission of the instructor.

798. RESEARCH PROBLEMS IN
RESOURCES MANAGEMENT

*Credit hours arranged according to
nature of problem*

Special investigation and analysis of resources management problems where integrative relationships of several subject aspects of forestry are a major consideration. Fall and Spring. Staff.

SILVICULTURE

302. SILVICS (SUMMER FIELD
SESSION)

1 credit hour

Dynamics of forest development; the species and their several characteristics—including tolerance, growth, survival, and patterns of reproduction; species interrelationships; successional trends—effects on forest stand structure. Observation of forest responses following natural catastrophe, logging, clearing, or fire. Introduction to principles of forest cover manipulation by man. Mr. Berglund and Mr. Johnson.

324. GENERAL SILVICULTURE

3 credit hours

Three hours of lecture per week for first half of semester; two hours of lecture and three hours of laboratory or field work per week during second half of semester. Presentation of silvicultural concepts, principles, and practices. Not designed for biology or resource management majors. Spring. Mr. Lea.

Prerequisite: Junior standing.

332. SOILS

3 credit hours

Two hours of lecture and three hours of laboratory. Introduction to the fundamentals of soil science with particular reference to forestry, but including other land uses. Fall. Mr. Craul.

351. METEOROLOGY AND FIRE
BEHAVIOR

3 credit hours

Lectures and recitations in atmospheric physics and the physics and chemistry of combustion lead to discussions of fire behavior and the strategy and tactics of fire suppression. Fall. Mr. Herrington.

Prerequisite: Physics 103 and 104 (Calculus helpful but not required).

497. SILVICULTURE SEMINAR

2 or 3 credit hours

Group study of selected silvicultural problems or situations of mutual interest. Emphasis is on critical evaluation and analysis and on organization and presentation of results from individual study for group consideration. Spring. Staff.

498. SPECIAL STUDIES IN
SILVICULTURE

1-3 credit hours

Independent research in silviculture for selected undergraduate students. Selection of subject areas determined by the student in conference with appropriate faculty member. Final written report is required for departmental record. Fall or Spring. Staff.

Prerequisite: Consent of instructor and department chairman.

520. APPLICATION OF ECOLOGY

3 credit hours

Two hours lecture and discussion and one to three hours seminar, laboratory or field trip per week. Examination of ecological concepts relevant to practices modifying terrestrial ecosystems for human benefit. Discussion of selected ecological literature, seminars, and field trips by specialists in various fields of applied ecology, and student presentations exploring ecological implications of specific problems or situations. Course designed for interdisciplinary participation. Spring or Fall. Mr. Richards.

Prerequisites: An ecology course or permission of instructor. Senior standing desirable.

521. PRINCIPLES OF
SILVICULTURE

3 credit hours

Three hours of lecture during the first half of the semester; two hours of lecture and three hours of laboratory during the second half of the semester. The forest as a community. Site factors and forest stand dynamics. Introduction to manipulation of forest cover to meet objectives of forest owners. Spring. Mr. Berglund.

Prerequisites: Summer Session in Field Forestry, F Bot 330 or F Bot 530 concurrently, or permission of instructor.

524. PRACTICES OF SILVICULTURE

3 credit hours

Two hours of lecture and one three-hour laboratory or field trip. Theory and practices of silviculture manipulation of forest stands to gain objectives of the forest owner. Emphasis is on thinning, reproduction cuttings, planting, and other silvicultural operations in their relationships to economic and ecological factors. Fall. Mr. Johnson.

Prerequisite: Silvi 521 or permission of the instructor.

525. ADVANCED PRACTICES OF SILVICULTURE

3 credit hours

Four hours of lecture and seminar during the first half of the semester; six hours of field exercises thereafter. Development of silvicultural decisions in management of woodlands. Trips to forest areas. A cultural plan prepared to attain assigned objectives. Spring. Mr. Lea.

Prerequisite: Silvi 524.

528. REGIONAL STUDIES

2 credit hours

Two hours of lecture. Study and analysis of the many factors that influence the silvicultural management of the important tree species of North America. These factors include importance of forest and forestry to a designated region, physiography, geology, soils, climate and weather, sites and site types, ecology, problems of protection and silvical characteristics of the more important species. Spring. Mr. Johnson.

Prerequisite: Silvi 524.

535. FOREST SOILS

3 credit hours

One hour of lecture, one hour of discussion, four hours of laboratory, field study of forest soils. Effect of silvicultural operations on soil. Selection of tree species for planting on different soils. Tree growth and development—soil properties relationships. Methods of soil sampling and laboratory analysis. Fall. Mr. Leaf.

Prerequisite: Silvi 332.

540. FOREST HYDROLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. The relation of forest and range vegetation to its environment, and its effect upon soil and water. Measurement of precipitation, runoff, erosion, and other variables. Fall and Spring. Mr. Eschner and Mr. Black.

542. PRACTICE OF WATERSHED MANAGEMENT

3 credit hours

Two hours of lecture, three hours of laboratory. The impact of the multiple use of forest and range lands on water yield and soil stability. Regional problems and potential solutions. Spring. Mr. Eschner.

Prerequisite: Silvi 540.

552. GENERAL METEOROLOGY

3 credit hours

Three hours of lecture. Examination of the physical processes of the atmosphere as they relate to the exchange of heat, moisture, and momentum in the earth-atmosphere system. Emphasis on the meteorological and micrometeorological basis of climate and its interaction with the biological world. Spring. Mr. Herrington.

Prerequisite: Junior standing or permission of instructor.

553. METEOROLOGY LABORATORY

1 credit hour

Three hours laboratory. An extension of Silvi 552 which provides analysis and discussion of the atmospheric processes important to weather and climate. Major topics include air mass analysis, surface weather map analysis, and climatological summarization procedures. Spring. Mr. Herrington.

Prerequisites: Silvi 552 or concurrently and permission of instructor.

577. FOREST TREE IMPROVEMENT

3 credit hours

Two hours of lecture, three hours of laboratory or field work. General principles and methods of tree improvement practiced in this country and abroad. Tree selection, techniques of vegetative propagation, hybridization, polyploidy, establishment of seed orchards, clonal and

offspring testing and other problems. Spring. Staff.

Prerequisites: F Biol 571 and 572 strongly advised.

625. PRODUCTIVITY OF FOREST STANDS

3 credit hours

Examination of forest tree and stand production variables as related to silvicultural manipulation. Analysis of stand response, such as rate of growth, stem form, product quality, tree value, and value. Preparation of stand treatment schedules. Spring. Mr. Richards and Mr. Johnson.

Prerequisite: Permission of instructor.

640. ADVANCED WILDLAND HYDROLOGY

3 credit hours

Lecture, discussion, and laboratory sessions in advanced problems of forest and range hydrology, watershed management methods and techniques, and evaluation of new methods of hydrologic data collection and analysis. Fall. Mr. Black.

Prerequisites: Silvi 540 or F Engr 340.

641. WATERSHED ANALYSIS

3 credit hours

One hour of lecture and six hours of laboratory each week. Lecture and field experience in watershed characterization, inventory, and analysis in terms of land management problems. Fall. Mr. Black.

Prerequisites: Silvi 540 and permission of instructor.

642. SNOW HYDROLOGY

3 credit hours

Three one-hour lectures per week and two three-day field trips. Physical characteristics of snow and the energy relations important in its accumulation and dissipation. Problems of measurement and prediction of runoff and melt. Potentials for management. Spring. Mr. Eschner.

Prerequisite: Silvi 540 or F Engr 340.

650. ENERGY EXCHANGE AT THE EARTH'S SURFACE

3 credit hours

Two hours lecture and three hours of laboratory. A comprehensive study of the physical processes taking place in the lowest layer of the atmosphere. Primary

emphasis on the turbulent transfer of heat, momentum, and water vapor and the expression of these fluxes in the microclimate. Spring. Mr. Herrington.

Prerequisites: Silvi 552, physics, and calculus.

677. ADVANCED FOREST TREE IMPROVEMENT

3 credit hours

Two hours lecture and discussion, three hours laboratory. A study of advanced principles and techniques for genetic improvement of forest trees. Special emphasis is placed on selection and breeding for growth rates, wood quality, and insect and disease resistance. Problems of tree hybridization, racial variations, sexual reproduction, and quantitative genetics in forest trees. Laboratory training in cytology and cytogenetics, pollen germination, vegetative propagation and other problems. Independent research problems will be undertaken by the student. Fall or Spring. Staff.

Prerequisites: F Biol 571 and 572, Silvi 577.

730. RESEARCH METHODS IN SILVICULTURE

3 credit hours

Three hours of lecture or discussion. Research concepts and methodology with particular application to silviculture and its related sciences. More appropriate to beginning students or before taking thesis work. Fall. Staff.

Prerequisite: Permission of instructor.

735. FOREST SOIL FERTILITY (APPLIED STUDIES)

2-4 credit hours

Two hours of lecture, one hour of discussion. None to six hours of laboratory depending on number of credit hours. Influence of soil fertility on development and growth of seedlings and trees, and techniques involved to determine this influence. Chemical and biological analysis to determine levels of soil fertility. Nutrient element deficiencies and their correction by soil amendments and fertilizers. Term projects by the student will be undertaken. Spring. Mr. Leaf.

Prerequisites: Chem 332 and 333, F Bot 530, Silvi 535, or equivalent.

737. FOREST SOIL PHYSICS

4 credit hours

Three hours of lecture and discussion and three hours of laboratory. Presentation of principles of soil physics including water flow, storage and availability, soil permeability, heat transfer, and their consideration as root environmental factors. Analytical procedures are introduced and evaluated. Applications of soil physics to silvics, soil fertility, watershed management and hydrology, soil biology and land-use. Spring. Mr. Craul.

Prerequisites: Silvi 332, 535, or their equivalents. Physical chemistry and integral calculus strongly recommended.

777. QUANTITATIVE GENETICS IN FOREST TREE IMPROVEMENT

3 credit hours

Two-hour lecture and discussion, three hours laboratory. Development of statistical models for determining heritability in forest trees. Breeding models and computer analysis application in forest genetics. Fall or Spring. Staff.

797. GRADUATE SILVICULTURE SEMINAR

1 credit hour

Three-hour class discussion per week. Assigned reports and discussion of silvicultural topics. Fall and Spring. Staff.

798. RESEARCH PROBLEMS IN SILVICULTURE

Credit hours arranged according to nature of problem

Hours to be arranged. Fall and Spring. Staff.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

WOOD PRODUCTS ENGINEERING

304. INTRODUCTION TO FOREST PRODUCTS

2 credit hours

Two hours of lecture. Characteristics of the products of the forest tree and manufacture of wood products. Fall. Mr. E. Anderson.

322. MECHANICAL PROCESSING

3 credit hours

Two hours of lecture, three hours of laboratory. Primary log reduction methods and industry practices. Lumber grading. Wood cutting principles. Machining practice in secondary wood-using industries. Experience in the operation of certain primary and secondary machining equipment. Fall. Mr. Moore.

390. FIELD TRIP

2 credit hours

Two weeks supervised study and reporting of representative wood products industries. Spring. Staff. Required of all students in WPE. Estimated individual expenses are \$100-150 while on the trip.

402. ELEMENTARY TIMBER MECHANICS

3 credit hours

Two hours of lecture, three hours of laboratory. Introduction to strength properties of wood, and wood products and other construction materials. Applications of these materials in typical construction problems. Fall. Mr. Kyanka.

Prerequisite: Senior standing or permission of instructor.

442. LIGHT CONSTRUCTION

3 credit hours

Two hours of lecture, three hours of laboratory. Elements of light frame construction, blueprint reading, and estimating. Fall. Mr. G. Smith.

486. ELEMENTARY WOOD TECHNOLOGY

2 credit hours

One hour of lecture, three hours of laboratory. Structure of wood in relation to defects, properties and uses. The variability of wood. Identification of major commercial U.S. timber by gross feature. Spring. Mr. deZeeuw and Staff.

487. WOOD STRUCTURE AND PROPERTIES

4 credit hours

Two hours of lecture, six hours of laboratory. Identification variability and anatomical characteristics of wood and papermaking fibers. Uses, properties and sources of wood and fibers. Structure of wood in relation to defects, properties, and uses. Fall. Mr. deZeeuw and Staff.

Prerequisite: F Bot 100 or consent of instructor.

497. SENIOR SEMINAR FOR WOOD PRODUCTS ENGINEERING MAJORS

2 credit hours

Discussion and assigned reports in current problems and new developments in wood products engineering. Fall. Staff.

498. RESEARCH OR DESIGN PROBLEM

1-3 credit hours

Conferences, library, laboratory, and/or field research on a specific problem in wood products engineering. Typewritten report (original and one copy) required. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

502. TIMBER MECHANICS

4 credit hours

Three hours of lecture and three hours of laboratory second semester. Mechanical properties of wood and elements of structures. Lectures, problems, and use of timber-testing equipment. Spring. Mr. Kyanka.

Prerequisites: Calculus, physics.

504. DESIGN OF WOOD STRUCTURAL ELEMENTS

3 credit hours

Lectures plus laboratory exercises. A development of the principles involved in designing structural elements in wood and practice in their application. Fall. Mr. Kyanka.

Prerequisite: WPE 502.

520. POLYMERIC ADHESIVES AND COATINGS

3 credit hours

Two hours of lecture, three hours of laboratory. Physical and chemical properties of organic adhesives and surface

coatings. Evaluation of application methods and performance on substrates. Spring. Mr. L. Smith.

Prerequisite: Junior standing.

522. COMPOSITE MATERIALS

3 credit hours

Two hours of lecture, three hours of laboratory. Manufacturing methods and physical properties of wood laminates, fiberboard, particleboard, plywood, paper overlays, sandwich materials, wood-polymer composites, and extruded and molded products. Fall. Mr. Moore.

Prerequisites: WPE 520, and WPE 526. Concurrent or prior registration in WPE 502 or 402.

526. FLUID TREATMENTS

2-3 credit hours

Two hours of lecture (2 credit hours), three hours of laboratory (1 credit hours). Steady-state and unsteady-state flow of liquids, gases, water vapor, and heat as related to wood structure. Wood preservative and fire-retardant treatments. Laboratory studies in permeability measurement, impregnation of wood with liquids, dry kiln operation, and wood preservation. Spring. Mr. Siau.

Prerequisites: WPE 487 and WPE 322 (WPE 322 waived when only lecture is taken).

544. MATERIALS MARKETING

3 credit hours

Three hours of lecture and discussion. Marketing functions, agencies, and management in the wood products and related industries. Principles of salesmanship and their application. Spring. Mr. G. Smith.

550. CONSTRUCTION EQUIPMENT

3 credit hours

Three hours lecture. Principles of selection, operation, and maintenance of construction equipment. Primary types of site preparation, handling and assembly devices and their efficient utilization will be examined. Spring. Mr. Kyanka.

Prerequisite: Senior standing.

554. CONSTRUCTION MANAGEMENT

3 credit hours

Two hours lecture, three hours of laboratory. Conception, management, and

control of the construction process with emphasis on specifications, costs, legal boundaries, erection planning and control, inspection and supervision. Spring. Mr. Whitt.

Prerequisite: Senior standing.

566. WOOD-WATER RELATIONSHIPS

3 credit hours

Two hours of lecture, three hours of laboratory. Consideration of basic wood-water relationships and the drying of lumber and other wood products. Fall. Mr. Skaar.

Prerequisites: Physics, calculus, WPE 526 or equivalent.

570. PRODUCTION SYSTEMS I: ANALYSIS

3 credit hours

Two hours of lecture, three hours of laboratory. Elements of system engineering. Analysis of performance characteristics of integrated production systems. Analysis of long-range vs. short-range system planning. A comprehensive lab problem is commenced which deals with the analysis prerequisite to the establishment of a manufacturing plant in a wood-processing industry. Fall. Mr. Whitt.

Prerequisites: Senior status and IE 548, A Math 591, and concurrent registration in IE 575 or equivalent.

572. PRODUCTION SYSTEMS II: SYNTHESIS

3 credit hours

Two hours of lecture and three hours of laboratory. Organization for production. Manufacturing engineering and production planning and control. Plant layout and materials handling. A comprehensive problem of production system synthesis is carried out in a succession of lab exercises oriented toward a wood-processing industry. Spring. Mr. Whitt.

Prerequisite: WPE 570 or equivalent.

585. MICROTECHNIQUE AND PHOTOMICROGRAPHY

3 credit hours

One lecture and demonstration laboratory, one laboratory. Preparation of plant and animal tissue for sectioning. Techniques of embedding, sectioning, staining and mounting. Photography

through the microscope. Film and print processing. Theory of the light microscope and brief introduction to electron microscopy. Fall. Mr. Côté.

Prerequisites: WPE 486 or WPE 487, and organic chemistry.

588. COMMERCIAL TIMBERS OF THE WORLD

3 credit hours

One hour of lecture, one hour of conference, three hours of laboratory, and assigned reading. Important commercial timbers of the world, their structure, physical properties, identification, supply and uses. Spring. Mr. deZeeuw.

Prerequisite: WPE 487.

596. SPECIAL TOPICS

1-3 credit hours

Lectures, conferences, discussions, recitations, problems, and laboratory. Special topics in wood products engineering: continuations, expansions, studies in depth, and new contemporary subject areas of concern to science or practice of wood products engineering. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

702. ELASTICITY OF WOOD AND PLYWOOD

3 credit hours

Theory of elasticity as applied to solid and laminated wood, sandwich material, and plywood. Elements of wood plasticity. Spring. Mr. Davidson.

Prerequisites: WPE 502, Physics 203, and Physics 204.

796. ADVANCED TOPICS

2 or 3 credit hours

Lectures, conferences, discussions, and laboratory. Advanced topics in wood products engineering, including advanced studies in one or more of the basic areas covered in other courses in wood products engineering. Fall or Spring. Staff.

Prerequisite: Consent of instructor.

797. WOOD PRODUCTS ENGINEERING SEMINAR

2 or 3 credit hours

Conference, discussion and reports analyzing current research and new developments, new literature and subject matter surveys in wood products engineering. Fall and Spring. Staff.

798. RESEARCH IN WOOD PRODUCTS ENGINEERING

Credit hours arranged according to nature of problem

Investigations on directed study in wood products engineering including manufacturing, marketing, anatomy, physics, quality, and mechanical properties of wood. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

860. ADVANCED WOOD PHYSICS

3 credit hours

Three hours of lecture. The physics of wood and wood-base materials. Treatment of wood-moisture relations with emphasis on movement of liquids and heat through wood. Derivation of the diffusion equations and their application to wood-treating and wood-drying processes. Spring. Mr. Skaar.

Prerequisites: WPE 566, Math 585.

880. INTERPRETATION OF CELLULAR ULTRASTRUCTURE

2 credit hours

One hour of lecture, two hours of demonstration and discussion. The organization and sculpturing of the walls of plant cells; the cellulose microfibril, matrix and incrusting substances, and the warty layer. The ultrastructure and general function of cytoplasmic organelles in cells. The tools and techniques used for light and electron microscopic study of cells, and the interpretation of structural evidence. Directed study and discussion of the latest (current) literature on pertinent topics. Spring. Mr. Cote.

Prerequisite: Permission of the instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.



FOREST ZOOLOGY*

100. GENERAL ZOOLOGY

4 credit hours

Prerequisite to all other courses in Forest Zoology. An auto-tutorial course with two hours of lecture and recitation, four hours in the learning center. A brief survey of major phyla with emphasis on morphology, taxonomy, evolution, and ecology followed by an introduction to the processes of maintenance, perpetuation, and adaptation by animal species. The importance of other animals to man and the ecosystem is emphasized. Spring. Mr. VanDruff.

200. WILDLIFE CONSERVATION

3 credit hours

Two hours of lecture, one hour of recitation. Introduction to the biological principles of conservation including the relationship of natural resources to modern society. The wildlife resource and

*See also listings for Forest Biology.

its conservation will be emphasized. It is not designed for students concentrating in the area of Forest Wildlife Management. Fall. Mr. Payne.

Prerequisite: One semester of biological science.

511. INVERTEBRATE ZOOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Structure, classification and evolution of invertebrates. Emphasis on role of specific invertebrates in their natural habitat. Spring. Mr. Dindal.

512. VERTEBRATE TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Identification and classification of vertebrates of central New York. Included are the principles of taxonomy, evolution, and distribution, collection procedures, and the use of field keys. Spring. Mr. Alexander.

516. ICHTHYOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. An introduction to the anatomy, physiology, ecology, behavior, and taxonomy of fishes. Spring. Mr. Werner.

520. TERRESTRIAL COMMUNITY ECOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Relations of terrestrial animals to their physical, chemical, and biological environment. Emphasis on community principles, succession and terrestrial adaptations. Fall. Mr. Dindal.

Prerequisite: A course in basic ecology.

523. INVERTEBRATE ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 423.

Two full days/week for four weeks. Study of terrestrial invertebrate microcommunities; descriptive and comparative assay of microhabitats incorporating experimental and field techniques. Summer Session I, Cranberry Lake Biological Station. Mr. Dindal, College of Environmental Science and Forestry.

Prerequisites: General biology, general ecology; invertebrate zoology is recommended.

524. VERTEBRATE ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 425.

Two full days/week for four weeks. Utilization of unique Adirondack forms and communities to study population dynamics, behavior, systematics, and ecological role of vertebrates; standard field and laboratory techniques. Summer Session II, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: 12 hours of biology.

525. LIMNOLOGY

3 credit hours

Two hours of lecture, and either three hours of laboratory or one hour of discussion per week. An introduction to the ecology of inland waters. Particular emphasis is placed on the aquatic environment as a habitat and the effect of changes in this environment on the structure and function of the biological communities contained therein. Fall. Mr. Werner.

526. ECOLOGY OF ADIRONDACK FISHES

2 credit hours

Cranberry Lake Biological Station, Session II, every third summer. Half time for four weeks. Study of the ecology of fishes, with detailed individual investigation of the ecology of Adirondack fishes. Mr. Werner.

Prerequisite: F Zool 516.

528. VERTEBRATE POPULATION ECOLOGY

3 credit hours

Two hours of lecture and one three-hour laboratory per week. Fundamental parameters of population structure and change with emphasis on vertebrate species. Fall. Mr. VanDruff.

Prerequisite: A course in general ecology.

530. ANIMAL PHYSIOLOGY

3 credit hours

Three hours lecture. Principles of digestion, circulation, respiration, excretion, physiologic defense mechanisms, muscle contraction, electrophysiology, neural and endocrinologic regulation, and reproduction. Spring. Mr. Hartenstein.

540. FISHERY BIOLOGY

2 credit hours

One hour of lecture, three hours of laboratory. Principles and techniques of handling fisheries resources in freshwater environments. Fall. Alternate even years. Mr. Werner.

Prerequisites: F Zool 525 and F Zool 516, or permission of instructor.

552. WILDLIFE ECOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. A study of the principles governing forest and range wildlife and of the biological mechanisms involved. Spring. Mr. Chambers.

Prerequisite: F Biol 320, or permission of instructor.

555. WILDLIFE METHODS

3 credit hours

Two hour lecture, three hour laboratory. Field and laboratory techniques, with emphasis on demonstration and experience. One weekend and Saturday field trips are scheduled. Fall. Mr. Chambers.

Prerequisite: F Zool 552.

570. PRINCIPLES OF ANIMAL BEHAVIOR

3 credit hours

Three hours of lecture per week. A study of the basic principles of animal behavior, stressing exogenous and endogenous mechanisms of control. Fall. Mr. Price.

Prerequisite: General Zoology.

575. BEHAVIORAL ECOLOGY

2 credit hours

Cranberry Lake Biological Station. Session I. Half time for four weeks. Study of the behavioral adaptations of animals to their environment. Emphasis will be placed on animal orientation and social behavior. Habitat selection and interspecific interactions will also be considered. Mr. Price, College of Forestry.

Prerequisites: General biology and general ecology.

Note: Credit may not be received for both F Zool 575 and F Zool 570.

580. HISTOLOGY

3 credit hours

Two hours of lecture; three hours laboratory. A study of mammalian tissues in the healthy and diseased states. Covers all tissues of the body: cartilaginous, bony, cardiovascular, lymphoid, integumentary, digestive, respiratory, urinary, endocrine, reproductive, and nervous. The laboratory deals with the preparation and examination of various kinds of tissues. Fall. Mr. Hartenstein.

Prerequisite: F Zool 100 or equivalent.

585. VERTEBRATE ANATOMY

4 credit hours

Three hours of lecture and recitation, three hours of laboratory. Comparative study of the anatomy of representative vertebrates, emphasizing structural, functional, and developmental characteristics. Fall. Mr. Graves.

620. INVERTEBRATE SYMBIOSIS

3 credit hours

Two hours of lecture and one three-hour laboratory. An introduction to the ecology and evolution of interspecific relationships of invertebrates. Spring, even years. Mr. Dindal.

Prerequisites: F Biol 320, F Zool 511.

630. COMPARATIVE ENDOCRINOLOGY

3 credit hours

Three hours lecture. General endocrinology with emphasis on the comparative functions of endocrine glands of animals. Spring. Mr. Graves.

Prerequisite: F Zool 530 or equivalent.

670. VERTEBRATE BEHAVIOR

3 credit hours

Two hours lecture, three hours laboratory. In-depth study of the major concepts of animal behavior associated with behavioral genetics, development, orientation, and social behavior. Spring. Mr. Price.

Prerequisite: F Zool 570.

700. FOREST ZOOLOGY TRIP

2 credit hours

A 7 to 10 day trip to (1) agencies engaged in zoological research, manage-

ment, and administration, or (2) regions or areas of unusual biological interest. A final report is required. Estimated student expense, \$75.00. Fall or Spring. Staff.

720. TOPICS IN SOIL INVERTEBRATE ECOLOGY

3 credit hours

Two one-hour lecture-discussion periods and a three-hour laboratory. Study of literature relating to soil invertebrate microcommunities; taxonomy, culturing, and collection methods of soil fauna; student will conduct an individual research problem. Spring. Odd years. Mr. Dindal.

Prerequisite: Permission of instructor.

725. ZOOGEOGRAPHY

3 credit hours

Two hours of lecture, three hours of laboratory. Geographic distribution of vertebrate animals, factors determining their distribution, and nature of range occupied. Fall. Alternate odd years. Mr. Webb.

750. ADVANCED WILDLIFE MANAGEMENT

3 credit hours

Two hours lecture, three hours laboratory. Advanced wildlife management with emphasis on regional and administrative wildlife problems. Extended trips (two weekend trips) are required. Spring. Mr. Chambers.

Prerequisite: F Zool 550 or permission of the instructor.

797. FOREST ZOOLOGY SEMINAR

1 credit hour

Two hours of discussion and assigned reports on current problems and new developments in forest zoology. Fall and/or Spring. Staff.

798. PROBLEMS IN FOREST ZOOLOGY

Credit hours to be arranged

Hours to be arranged. Individual study of special problems in forest zoology. One typewritten report (original and one carbon) required. Fall and/or Spring. Staff.

830. PHYSIOLOGICAL ECOLOGY

3 credit hours

Two hours lecture, one hour discussion. An examination of the concepts of animal adaptation to ecological change from a physiological point of view. Particular emphasis will be placed on physiological responses of the vertebrate digestive, excretory, endocrine, nervous, and reproductive systems to modifications of the environment. Spring, odd numbered years. Mr. Graves.

Prerequisite: F Zool 630.

835. INVERTEBRATE PHYSIOLOGY

3 credit hours

Two hours lecture, three hours laboratory. A study of the physiologic mechanisms employed by invertebrates other than insects in coping with the exigencies of their environment. Fall or Spring. Alternate years. Mr. Hartenstein.

Prerequisites: F Zool 511 and F Zool 530.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

950. TOPICS IN WILDLIFE BIOLOGY

1-3 credit hours

Hours to be arranged. Group study of a wildlife management topic. Fall or Spring. Mr. Chambers.

Prerequisite: Six credits of wildlife management courses.

970. TOPICS IN ANIMAL BEHAVIOR

2 credit hours

Two hours lecture and discussion. A seminar-type course designed to explore in depth selected and controversial subject areas in animal behavior. Fall or Spring. Mr. Price.

Prerequisite: F Zool 670 or equivalent.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

RANGER SCHOOL COURSES (Wanakena-Campus)

FOREST TECHNOLOGY

200. DENDROLOGY I

2 credit hours

32 hours of lecture and 42 hours of field time. A study of the distinguishing characteristics, growth features, distribution, associates, and importance of the major tree species of North America.

Seasonal field identification and on-the-spot discussion of habitats, associates, and the place in succession of the predominant forest trees and shrubs as found in the Adirondack area of the Northeast, plus a limited number of introduced species. Fall. Mr. Coufal.

201. DENDROLOGY II

1/2 credit hour

10 hours of field time. A continuation of Dendrology I, with special emphasis on identification and use as site indicators, for example ground cover plants. Spring. Mr. Coufal.

Prerequisite: F Tech 200.

202. PLANE SURVEYING I

4 credit hours

F Tech 202 and 203 together include 60 hours of lecture and 184 hours of field time. A comprehensive study of the theory and practice of plane surveying with particular stress on the development of proper field procedures and competency in the use of surveying instruments. Fall. Mr. Castagnozzi.

203. PLANE SURVEYING II

3 credit hours

F Tech 202 and 203 together include 60 hours of lecture and 184 hours of field time. A comprehensive study of the theory and practice of plane surveying with particular stress on the development of proper field procedures and competency in the use of surveying instruments. Spring. Mr. Castagnozzi.

Prerequisite: F Tech 202.



204. FOREST MENSURATION AND STATISTICS I

3 credit hours

32 hours of lecture and 52 hours of field time. A classroom and field study of the basic principles and skills required for timber measurements. Volume tables, their use and construction are studied. Cruise reports are required in which the student describes cruise procedures and results. Fall. Mr. Martin.

205. FOREST MENSURATION AND STATISTICS II

2 1/2 credit hours

22 hours of lecture and 44 hours of field time. A classroom, field and laboratory study of the methods utilized for collecting, analyzing, and presenting data dealing with forest measurements. In addition, the student learns to scale and grade logs and other forest products. Spring. Mr. Martin.

206. FOREST ECOLOGY

1 1/2 credit hours

28 hours of lecture and 20 hours of field time. Study of weather and weather data collection; students manning a forest weather station. Study of weather and soil factors as to how they affect trees and forests, plus the interactions within the forest community and with the environment. Attention given to the School forest soils survey with field trips to study soil and site relationships. Fall. Mr. Remele.

207. AERIAL PHOTOGRAMMETRY

1 1/2 credit hours

17 hours of lecture and 28 hours of laboratory. Development of the ability

to interpret important ground features by viewing aerial photos singly and in pairs, using stereoscopic techniques and equipment. Instruction in the use of other interpretation and photo measuring equipment for making useful overlays and maps. Spring. Mr. Remele.

208. FOREST INSTALLATIONS

3 credit hours

42 hours of lecture and 60 hours of field time. This course provides the student with the technical competence necessary to use, plan, construct, and maintain such typical forest improvements as telephone lines, radio systems, trails, small streams, and light frame structures. Fall. Mr. Miller.

209. FOREST ROADS

2 credit hours

17 hours of lecture and 44 hours of field time. This course provides the student with the technical competence necessary to administer, locate, and design the construction and maintenance of a typical forest gravel road. Spring. Mr. Miller.

210. SILVICULTURE I

1½ credit hours

F Tech 210 and 211 together include 52 hours of lecture and 24 hours of field time. Orientation regarding the place, terminology, and methods of silviculture. Coverage of the most generally used techniques for establishing and manipulating the more important forest types in the Northeast for ecological and economical satisfaction. Field demonstrations and practice in planting, thinning, pruning, timber marking, and chemical silviculture. Fall. Mr. Remele.

Prerequisite: Forest ecology.

211. SILVICULTURE II

1½ credit hours

F Tech 210 and 211 together include 52 hours of lecture and 24 hours of field time. Orientation regarding the place, terminology, and methods of silviculture. Coverage of the most generally used techniques for establishing and manipulating the more important forest types in the Northeast for ecological and economical satisfaction. Field demonstrations and practice in planting, thinning, pruning,

timber marking, and chemical silviculture. Spring. Mr. Remele.

Prerequisites: Forest ecology, F Tech 210.

212. GENERAL FORESTRY

1½ credit hours

27 hours of lecture. An introduction to the scope and objectives of forestry. Consideration is given to historical development, forest terminology, and forest policy. Forest agencies, both public and private, are examined. A survey of the various kinds of forestry occupations is made, with emphasis on technician level opportunities. Current events in forestry are discussed. Forest programs, education, and trends for the future are analyzed. Fall. Staff.

213. FOREST PROTECTION

2½ credit hours

32 hours of lecture and 44 hours of field time. A study of the agents damaging trees and their role in the total forest community. The basic principles of forest fire behavior, fire danger and fire danger rating, and the prevention and control of forest fires are covered. Fire simulation exercises and practice of fire suppression techniques are given.

The course covers identification of local forest insects and disease-causing organisms, study of the major pest groups of other forest regions, and control measures including the effects of pesticides in the environment. Field trips cover local pests and the damage caused while laboratory work covers major groups of pests likely to be encountered elsewhere. Spring. Mr. Coufal.

214. PERSONNEL MANAGEMENT

1½ credit hours

31 hours of lecture and 2 hours of field time. The role of personnel management within industrial companies and governmental agencies, with special consideration given the foreman level. A study of company and agency organizational groups including selection of and placement of personnel, training of personnel and personnel performance evaluations, planning for and administering crew responsibilities, human relations in the working situation, and special personnel problems of the forest technician and professional forester are covered.

Techniques of foremanship are applied in various field exercises in other courses, along with a study of safety hazards, accident prevention, accident classification, and accident reporting. Responsibility of management, particularly the foreman, in safe working procedures is incorporated. Twelve hours of first aid training are included. Fall. Staff.

215. TIMBER HARVESTING

1½ credit hours

21 hours of lecture and 24 hours of field time. This course acquaints the student with the basic harvesting methods and techniques, with emphasis on the Northeast, along with the knowledge of how and where harvesting fits in with other forest uses. Students gain technical competence in timber sale contract administration and basic timber appraising. Spring. Mr. Miller.

216. WOOD TECHNOLOGY

1½ credit hours

17 hours of lecture and 20 hours of laboratory. Study of the development of various cell and tissue structures within trees, the gross structural features of wood, and the part these features play in the physiological processes of living trees. Physical properties of wood are studied with special emphasis given to those gross features which identify species. Attention is given wood quality, defects of wood, and those special features which make certain species desirable for specific uses.

In the laboratory a variety of samples from the more commercially important lumber trees of North America are identified by the use of a gross feature key and 10X magnification. Fall. Staff.

217. FOREST MANAGEMENT

1½ credit hours

25 hours of lecture and 16 hours of field time. The relation of silviculture to management. Subdivisions and classification of forest properties. Determination of growing stock and growth. The forms of managed forests and methods by which forests are brought to a regulated condition. Field and lab work in preparation for a report giving recommendations for management of a portion of the School Forest. Spring. Mr. Remele.

218. FOREST RECREATION

1 credit hour

23 hours of lecture. This course acquaints the student with the forest recreational resource—its present and future needs. Principles of recreational development and management are discussed with special emphasis placed on the technical aspects. Fall. Mr. Miller.

219. ELEMENTS OF WILDLIFE ECOLOGY

1½ credit hours

19 hours of lecture and 26 hours of field time. A study of the principles of wildlife ecology with fundamentals related to the actions of the preservationist, conservationist, and particularly those of the forest manager. Spring. Mr. Martin.

Prerequisite: A course in biology or its equivalent.

221. WOOD UTILIZATION

1 credit hour

18 hours of lecture and 8 hours of field time. An introductory course in forest products utilization to give an appreciation of how wood is utilized so that forestry field practices in silviculture, management, and harvesting may be better understood. Spring. Staff.

223. REGIONAL SILVICULTURE

1 credit hour

24 hours of lecture. Consideration of the significant biological, physical, and economic qualities of the various forest regions of the United States and the effect these qualities have on silvicultural practices. The physiography, geology and soils, climate and weather, and the operating economics of each forest region are covered, with emphasis on the silvics and ecology of the major tree species and associations. Spring. Mr. Coufal.

225. REGIONAL FORESTRY PRACTICES

1½ credit hours

64 hours of field time. An 8-day field trip to provide concentrated and varied field observation. It is conducted during the fourth semester to give the student first-hand observation of the current forestry practices in the northeastern part of the United States. Spring. Staff and faculty.

X

THE COLLEGE FACULTY AND PROFESSIONAL STAFF

- MAURICE M. ALEXANDER (1949)*, *Professor and Chairman*, Department of Forest Zoology; B.S., State University of New York College of Forestry, 1940; M.S., University of Connecticut, 1942; Ph.D., State University of New York College of Forestry, 1950
- DOUGLAS C. ALLEN (1968)*, *Assistant Professor*, Department of Forest Entomology; B.S., University of Maine, 1962; M.S., 1965; Ph.D., University of Michigan, 1968
- DAVID G. ANDERSON (1959), *Vice President for Administration, Associate Professor*; State University of New York College of Forestry (Ranger School), 1950; B.S., State University of New York College of Forestry, 1953; M.S., University of Utah, 1958
- ERIC A. ANDERSON (1950)*, *Professor*, Department of Wood Products Engineering; B.S.F., University of Washington, 1932; Ph.D., State University of New York College of Forestry, 1949
- GEORGE R. ARMSTRONG (1950)*, *Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1949; M.S., 1959; Ph.D., 1965
- ALAN L. AUGUST (1969), *Assistant to the Dean of Graduate Studies*, Graduate Office; B.A., American University, 1964; M.A. Syracuse University, 1968
- JAMES P. BAMBACHT (1967), *Instructor*, Department of Paper Science and Engineering; A.B., Kalamazoo College, 1954; M.S., The Institute of Paper Chemistry, 1956
- DONALD F. BEHREND (1960-67) (1968)* *Director of the Adirondack Ecological Center, Senior Research Associate*; B.S., University of Connecticut, 1958; M.S., 1960; Ph.D., State University of New York College of Forestry, 1966
- LEE U. BENDER (1970)*, *Associate Professor*, Department of Forest Engineering; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1959; M.S., 1960; Ph.D., Ohio State University, 1971
- JOHN D. BENNETT (1960)*, *Associate Professor*, School of Environmental and Resource Management; B.A., Ohio Wesleyan University, 1954; Ph.D., Syracuse University, 1968
- JOHN V. BERGLUND (1965)*, *Associate Professor*, School of Environmental and Resource Management; B.S., Pennsylvania State University, 1962; M.S., 1964; Ph.D., State University of New York College of Forestry, 1968
- ALFRED H. BISHOP (1942), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Professor*; State University of New York College of Forestry (Ranger School), 1925; B.S., State University of New York College of Forestry, 1929; M.F., 1931

- PETER E. BLACK (1965)*, *Associate Professor*, School of Environmental and Resource Management; B.S., University of Michigan, 1956; M.F., 1958; Ph.D., Colorado State University, 1961
- WILLIAM R. BORGSTEDE (1971), *Technical Assistant*, Department of Forest Zoology; A.A.S., Miner Institute, 1966; A.A.S., State University of New York College at Delhi, 1970
- JOHANNA E. BOWEN (1968), *Assistant Librarian*, Moon Memorial Library; B.A., University of Illinois, 1956; M.L.S., 1966
- JEROME BREZNER (1961)*, *Professor*, Department of Forest Entomology; A.B., University of Rochester, 1952; A.M., University of Missouri, 1956; Ph.D., 1959
- ROBERT H. BROCK, JR. (1967)*, *Associate Professor*, Department of Forest Engineering; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Cornell University, 1971
- RANIER H. BROCKE (1969), *Research Associate*, Department of Forest Zoology; B.S., Michigan State University, 1955; M.S., 1957; Ph.D., 1970
- HARRY W. BURRY (1962), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., State University of New York College of Forestry, 1941; M.F., 1964
- PAUL M. CALUWE (1969), *Research Associate*, Department of Forest Chemistry; M.S., University of Louvain, 1964; Ph.D., 1967
- ROBERT CAMPBELL (1972), *Adjunct Associate Professor*, School of Biology, Chemistry and Ecology; B.S., State University College of Forestry, 1953; M.F., University of Michigan, 1959; Ph.D., 1961
- HUGH O. CANHAM (1966), *Assistant Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ph.D., 1971
- DIANNE M. CAPRITTA (1967), *Assistant Librarian*, Moon Memorial Library; B.S., University of Illinois, 1965; M.S.L.S., Syracuse University, 1967
- RHONDDA K. CASSETTA (1967), *Associate for Institutional Research*, Office of the Vice President for Administration; A.B., Elmira College, 1933
- DANIEL M. CASTAGNOZZI (1956), *Professor and Acting Director*, Ranger School, State University of New York College of Forestry (Ranger School), 1950; B.S.F., University of Michigan, 1952; M.F., State University of New York College of Forestry, 1957
- THOMAS CERNY (1970), *Assistant Director of Admissions*, Office of the Vice President for Student Affairs; B.S., Springfield College, 1965; M.Ed., 1966
- ROBERT E. CHAMBERS (1967), *Assistant Professor*, Department of Forest Zoology; B.S., Pennsylvania State University, 1954; M.S., 1956
- ANTHONY W. CHELZ (1970), *Instructor*, School of Landscape Architecture; B.A.E., School of the Art Institute, 1966; M.F.A., Syracuse University, 1970

- NEILS B. CHRISTIANSEN (1960)*, *Associate Professor*, School of Environmental and Resource Management; B.S., University of Idaho, 1957; M.S., State University of New York College of Forestry, 1959; Ph.D., 1966
- C. PETER CLUTE (1969), *Assistant to the President*, Office of the President; B.A., University of Toronto, 1965
- ROLLA W. COCHRAN (1964), *Assistant to the President for Community Relations*, Office of the President, *Associate Professor*; B.A., Denison University, 1949; M.S., Ohio State University, 1951
- JACK B. CODY (1968), *Senior Research Associate*, Applied Forestry Research Institute; B.S., University of Michigan, 1954; M.F., 1963
- HARRY J. CORR, *Director of Business Affairs*, Office of the Vice President for Administration; B.S., Siena College, 1957
- WILFRED A. CÔTÉ, JR. (1950)*, *Professor*, Department of Wood Products Engineering, *Director*, Ultrastructure Study Services; B.S., University of Maine, 1949; M.F., Duke University, 1950; Ph.D., State University of New York College of Forestry, 1958
- JAMES E. COUFAL (1965), *Assistant Professor*, Ranger School; State University of New York College of Forestry (Ranger School), 1957; B.S., State University of New York College of Forestry, 1960; M.S., 1962
- PHILIP J. CRAUL (1968)*, *Assistant Professor*, School of Environmental and Resource Management; B.S.F., Pennsylvania State University, 1954; M.S., 1960; Ph.D., 1964
- TIBERIUS CUNIA (1968)*, *Professor*, School of Environmental and Resource Management; Forest Engineer, Ecole Nat. des Eaux et Forêts, 1951; M.S., McGill University, 1957
- GEORGE W. CURRY (1966), *Associate Professor*, School of Landscape Architecture; B.A., Michigan State University, 1962; B.S., 1965; M.L.A., University of Illinois, 1967
- ROBERT W. DAVIDSON (1957)*, *Professor and Chairman*, Department of Wood Products Engineering; B.S., Montana State University, 1948; M.S., State University of New York College of Forestry, 1956; Ph.D., 1960
- RUSSELL C. DECKERT (1952), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Professor*; B.S.F., University of Georgia, 1938; M.F., Duke University, 1943
- CARLTON W. DENCE (1951)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; B.S., Syracuse University, 1947; M.S., State University of New York College of Forestry, 1949; Ph.D., 1959
- CARL H. DE ZEEUW (1946)*, *Professor*, Department of Wood Products Engineering; A.B., Michigan State College, 1934; B.S., 1937; M.S., State University of New York College of Forestry, 1939; Ph.D., 1949

- DANIEL L. DINDAL (1966)*, *Associate Professor*, Department of Forest Zoology; B.S., Ohio State University, 1958; M.A., 1961; Ph.D., 1966
- WILLIAM A. DUERR (1952)*, *Distinguished Professor*, School of Environmental and Resource Management; B.S., Iowa State College, 1934; M.S., University of Minnesota, 1939; A.M., Harvard University, 1941; Ph.D., 1944
- GEORGE F. EARLE (1952)*, *Professor*, School of Landscape Architecture; B.F.A., Syracuse University, 1937; M.F.A., Yale University, 1946
- HERBERT E. ECHELBERGER (1966), U.S. Forest Service Cooperative Recreation and Related Environmental Studies Research Unit, *Adjunct Assistant Professor*; B.S., Southern Illinois University, 1965; M.S., 1966
- ANDREW L. EGGERS (1967), *Media Engineer*; Office of Public Service and Continuing Education
- JOHN H. ENGELKEN (1959), *Assistant Professor, Forest Manager*, Heiberg Forest, Tully Campus; B.S.F., Utah State University, 1950
- ARTHUR R. ESCHNER (1961)*, *Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1950; M.S., Iowa State College, 1952; Ph.D., State University of New York College of Forestry, 1965
- ALAN D. FINNEGAN (1968), *Director of Student Counseling*, Office of the Vice President for Student Affairs; B.S., St. Lawrence University, 1955; M.Ed., 1959
- JEAN E. FISHER (1963), *Senior Research Associate*, Applied Forestry Research Institute, *Professor*; B.S., University of Idaho, 1941
- WARREN A. FLICK, *Research Assistant*, School of Environmental and Resource Management; State University of New York College of Forestry (Ranger School), 1964; B.S., State University of New York College of Forestry, 1967
- CLAUDE C. FREEMAN (1959), *Assistant Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1959
- ROBERT L. FRIEDMAN (1967), *Director of Admissions*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952; M.A., 1954
- WILLIAM J. GABRIEL (1968), *Senior Research Associate*, Applied Forestry Research Institute; B.S., Michigan State University, 1964
- GERALD M. GARTHE (1967), *Research Associate*, School of Environmental and Resource Management; B.S., University of Idaho, 1961; M.F., North Carolina State University, 1965; Ph.D., State University of New York College of Forestry, 1972
- JAMES W. GEIS (1968), *Assistant Professor*, Department of Forest Botany and Pathology; B.S.F., University of Illinois, 1965; M.S., 1967; Ph.D., State University of New York College of Forestry, 1972
- RUSSELL E. GETTY (1966)*, *Professor*, School of Environmental and Resource Management; B.S., Iowa State College, 1936; M.S., 1951

- SERGE N. GORBATSEVICH (1956)*, *Associate Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1954; M.S., 1955
- PAUL F. GRAVES (1947)*, *Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1939; M.F., 1941; Ph.D., Syracuse University, 1950
- WILLIAM E. GRAVES (1967)*, *Associate Professor*, Department of Forest Zoology; B.S., University of Massachusetts, 1963; M.S., University of Wisconsin, 1965; Ph.D., 1967
- DONALD F. GREEN (1965), *Registrar*, Office of the Vice President for Student Affairs, *Associate Professor*; A.B., New York State College for Teachers, Albany, 1942; M.S., 1950
- DAVID H. GRIFFIN (1968)*, *Associate Professor*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1959; M.A., University of California, 1960; Ph.D., 1963
- DAVID G. GRIMBLE (1968), *Senior Research Associate*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1961; B.S., Michigan Technical University, 1964; M.F., University of Michigan, 1966
- AUSTIN F. HAMER (1968), *Coordinator of Continuing Education*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., Oregon State University, 1942; M.S., University of Oregon, 1962
- DAVID L. HANSELMAN (1963)*, *Coordinator of Educational Communications*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., Cornell University, 1957; M.S., 1958; Ph.D., Ohio State University, 1963
- DAVID B. HARPER (1972), *Research Associate*, School of Landscape Architecture; B.S., Bates College, 1959; M.R.P., University of Pennsylvania, 1969
- ROY C. HARTENSTEIN (1959-1965, 1967)*, *Professor*, Department of Forest Zoology; B.S., State Teachers College at Buffalo, 1953; M.S., Syracuse University, 1957; Ph.D., State University of New York College of Forestry, 1959
- DAVID R. HAYNER (1968; 1971), *Administrative Assistant*, Ranger School; State University of New York College of Forestry (Ranger School), 1968; B.S. State University of New York College of Forestry, 1971
- ROBERT D. HENNIGAN (1967)*, *Professor*, School of Environmental and Resource Management; B.C.E., Manhattan College, 1949; M.A., Syracuse University, 1964
- LEE P. HERRINGTON (1965)*, *Associate Professor*, School of Environmental and Resource Management; B.S., University of Maine, 1959; M.F., Yale University, 1960; Ph.D., 1964
- BERNARD T. HOLTMAN (1968), *TV/Motion Picture Producer-Director*, Office of Public Service and Continuing Education; B.A., Siena College, 1950

- ALLEN F. HORN, JR. (1957)*, *Professor*, School of Environmental and Resource Management; B.S., Michigan State University, 1950; M.S., 1951; Ph.D., State University of New York College of Forestry, 1957; L.L.B., Syracuse University, 1967
- TERENCE J. HOVERTER (1960), *Librarian*, Moon Memorial Library, *Professor*; A.B., Fordham University, 1937; B.S. in L.S., Columbia University, 1939; M.A., Fordham University, 1954
- ROBERT V. JELINEK (1972), *Professor and Dean*, School of Environmental and Resource Engineering; B.S., Columbia University, 1945; M.S., 1947; Ph.D., 1953
- HAZEL S. JENNISON (1965), *Research Assistant*, Department of Forest Chemistry; B.S., Western Kentucky State College, 1941; M.S., Syracuse University, 1966
- JOHN W. JOHNSON (1970)*, *Professor*, School of Environmental and Resource Management; B.S., University of Michigan, 1946
- RONALD R. KARNS (1965), *Editor*, Office of Public Service and Continuing Education; B.S., Ohio State University, 1954
- JOSEPH D. KASILE (1965), *Assistant Professor*, School of Environmental and Resource Management; B.S., Iowa State University, 1959; M.S., Oregon State University, 1960
- EDWIN H. KETCHLEDGE (1955)*, *Professor*, Department of Forest Botany and Pathology, *Associate Director*, Cranberry Lake Biological Station, Cranberry Lake Campus, *Forest Manager*, Pack Demonstration Forest, Cranberry Lake, Cranberry Lake Campus; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., Stanford University, 1957
- THEODORE J. KOCHANЕК (1936), *Director of Physical Plant*; Office of the Vice President for Administration
- DONALD E. KOTEN (1961)*, *Associate Professor*, School of Environmental and Resource Management; B.A., North Central College, 1951; B.S., Oregon State College, 1957; Ph.D., State University of New York College of Forestry, 1966
- MARTIN KRONMAN (1970), *Adjunct Professor*, Department of Forest Chemistry; B.S., Rutgers University, 1950; Ph.D., Temple University, 1955
- FRANK E. KURCZEWSKI (1966)*, *Associate Professor*, Department of Forest Entomology; B.S., Allegheny College, 1958; M.S., Cornell University, 1962; Ph.D., 1964
- GEORGE H. KYANKA (1967), *Assistant Professor*, Department of Wood Products Engineering; B.S., Syracuse University, 1962; M.S., 1966
- CHARLES N. LAFORTY (1965), *Assistant Facilities Program Coordinator*; Office of the Vice President for Administration
- ROBERT T. LALONDE (1959)*, *Professor*, Department of Forest Chemistry; B.A., St. John's University, 1953; Ph.D., University of Colorado, 1957

- RICHARD W. LALOR (1953), *Associate Professor of English*; B.S., New York State College for Teachers, Albany, 1941; A.M., Cornell University, 1946
- GERALD N. LANIER (1970)*, *Assistant Professor*, Department of Forest Entomology; B.S., University of California, 1960; M.S., 1965; Ph.D., 1967
- RONALD F. LAPLAINE (1953), *Research Assistant*; Department of Paper Science and Engineering
- CHARLES C. LARSON (1950)*, *Professor and Dean*, School of Environmental and Resource Management; A.S., North Dakota State School of Forestry, 1938; B.S., University of Minnesota, 1940; M.S., University of Vermont, 1943; Ph.D., State University of New York College of Forestry, 1952
- RICHARD V. LEA (1946-56; 1967)*, *Associate Professor*, School of Environmental and Resource Management; *Director*, Summer Field Session, Warrensburg Campus; B.S., State University of New York College of Forestry, 1946; M.S., 1948; Ph.D., 1953
- ALBERT L. LEAF (1957)*, *Professor*, School of Environmental and Resource Management; B.S.F., University of Washington, 1950; M.F., 1952; Ph.D., University of Wisconsin, 1957
- CHARLES N. LEE (1959)*, *Director*, Computer Center, *Professor*, Department of Forest Engineering; B.S. State University of New York College of Forestry, 1949; B.C.E., Syracuse University, 1957; M.C.E., 1959
- RAYMOND E. LEONARD (1964)*, U.S. Forest Service Cooperative Watershed and Related Environmental Studies Research Unit, *Adjunct Professor*; B.S., University of Vermont, 1955; M.M.M., University of Helsinki, 1957; M.F., Yale University, 1964; Ph.D., State University of New York College of Forestry, 1967
- BENGT LEOPOLD (1961)*, *Director*, Empire State Paper Research Institute, *Professor*, B.Sc., Royal Institute of Technology, Stockholm, 1947; Licentiat, 1949; Ph.D., 1952
- GIDEON LEVIN (1972), *Research Associate*, State University Polymer Research Center; B.S., Technion, Israel Institute of Technology, 1960; M.S., Purdue University, 1965; Ph.D., State University of New York College of Forestry, 1971
- ALLEN R. LEWIS (1970), *Assistant Professor*, School of Landscape Architecture; B.A., University of Oklahoma, 1959; M.C.P., University of California (Berkeley), 1961
- JOHN F. LITCHER (1970), *Director of Campus Security*, Office of the Vice President for Administration; A.A.S., Onondaga Community College, 1968
- JOSIAH L. LOWE (1933)*, *Professor*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1927; Ph.D., University of Michigan, 1938

- PHILIP LUNER (1957)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; B.Sc., University of Montreal (Loyola College), 1947; Ph.D., McGill University, 1951
- J. DONALD MABIE (1967), *Assistant Research Coordinator*, Office of the Vice President for Research; B.S., State University of New York at Albany, 1961
- WALTER A. MAIER (1966), *Research Assistant*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1960
- PAUL D. MANION (1967)*, *Associate Professor*, Department of Forest Botany and Pathology; B.S., University of Minnesota, 1962; M.S., 1965; Ph.D., 1967
- FRANK L. MARAVIGLIA (1964), *Assistant Professor*, School of Landscape Architecture; B.S., State University of New York College of Education, Oswego, 1958; M.S., Hofstra University, 1963
- RICHARD E. MARK (1969)*, *Senior Research Associate*, Empire State Paper Research Institute, *Adjunct Associate Professor*; B.S., State University of New York College of Forestry, 1950; M.S., Yale University, 1960; Ph.D., 1965
- DANIEL L. MARLATT (1968), *Forester*, Huntington Forest, Newcomb Campus; A.A.S., Paul Smith's College, 1960; B.S., State University of New York College of Forestry, 1962
- RAYMOND L. MARLER (1970), *Director and Senior Research Associate*, Applied Forestry Research Institute; B.S., University of Michigan, 1948; M.F., 1948
- CHARLES E. MARTIN II (1962), *Associate Professor*, Ranger School; B.S., Duke University, 1953; M.F., 1954
- RENATA MARTON (1957)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; Master Ph. (Chemistry), Jagiello University, 1934; Ph.D., 1936
- GEORGE F. MATTFELD (1965), *Research Assistant*, Huntington Forest, Newcomb Campus; B.S., State University of New York College of Forestry, 1962; M.S., University of Michigan, 1964
- MICHAEL C. McCLOSKEY (1969), *Personnel Associate*, Office of the Vice President for Administration; State University of New York College of Forestry (Ranger School), 1964; B.S., State University of New York College of Forestry, 1969
- LARRY L. McDOWELL (1964)*, *Research Associate*, Department of Forest Botany and Pathology; B.S., Utah State University, 1958; Ph.D., Oregon State University, 1964
- JOHN A. MEYER (1958)*, *Senior Research Associate*; *Professor*, Department of Forest Chemistry; B.S., Pennsylvania State College, 1949; M.S., 1950; Ph.D., State University of New York College of Forestry, 1958

- HOWARD C. MILLER (1950), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Professor*; B.S., State University of New York College of Forestry, 1941; Ph.D., Cornell University, 1951
- RICHARD W. MILLER (1966), *Assistant Professor*, Ranger School; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1956
- LEON S. MINCKLER (1970)*, *Adjunct Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1928; Ph.D., 1936
- GEORGE MOELLER (1968), *Project Director*, U.S. Forest Service Cooperative Recreation and Related Environmental Studies Research Unit, *Adjunct Associate Professor*; B.S., Southern Illinois University, 1963; M.S., 1965
- JAMES O. MOORE (1965), *Manager*, Computer Center; B.M.E., Rensselaer Polytechnic Institute, 1960
- RAYMOND A. MOORE (1954)*, *Assistant Professor*, Department of Wood Products Engineering; B.S.F., West Virginia University, 1951; M.S., North Carolina State College, 1952
- DOUGLAS A. MORRISON (1969)*, *Research Associate*, School of Environmental and Resource Management; B.A., University of Western Ontario, 1966; M.S., University of Oregon, 1967; Ph.D., 1969
- TSUTOMU NAKATSUGAWA (1968)*, *Associate Professor*, Department of Forest Entomology; B. Agric., Tokyo University, 1957; M.S., Iowa State University, 1961; Ph.D., 1964
- ROGER L. NISSEN, JR. (1971), *Technical Assistant*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1970
- JOHN D. NOVADO (1967), *Editorial Associate*, Office of Public Service and Continuing Education; B.A., Syracuse University, 1965
- RALPH D. NYLAND (1967), *Senior Research Associate*, Applied Forestry Research Institute; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Michigan State University, 1966
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Director of the Ranger School
Daniel M. Castagnozzi

*Dean of Public Service,
Continuing Education and
Educational Communications*
John M. Yavorsky

SYRACUSE CAMPUS

(PROFESSIONAL PROGRAMS AND GRADUATE STUDY)

REGULAR SESSION — 1973

Fall 1973

Residences Open, new students	August 26	Sunday, 8 a.m.
Orientation Program begins	August 26	Sunday
REGISTRATION	August 28, 29, 30	Tuesday–Thursday
Classes Begin	August 31	Friday
LABOR DAY (no classes or library)	September 3	Monday
Middle of First Semester	October 24	Wednesday
Vacation	November 21–26	Wednesday, 12 noon– Monday, 8 a.m.
Last Day of Classes	December 13	Thursday, 11 p.m.
Examinations	December 14–21	Friday–Friday
Vacation and Intersession	December 22– January 8	Saturday–Tuesday

Spring 1974

REGISTRATION	January 9–11	Wednesday–Friday
Classes Begin	January 12	Saturday
Middle of Second Semester	March 7	Thursday
Mid-Semester Vacation	March 16–25	Saturday, 12 noon– Monday, 8 a.m.
Last Day of Classes	April 27	Saturday, 12 noon
Examinations	April 29–May 8	Monday–Wednesday
Commencement	May 11	Saturday

ACADEMIC CALENDARS

SUMMER SESSIONS — 1974 Tentative

First Session	May 20–June 28	6 weeks
Second Session	July 1–August 9	6 weeks

WANAKENA CAMPUS (FOREST TECHNOLOGY PROGRAM)

1973–74

Students Arrive	August 23, 24, 1973	Thursday–Friday
Classes Begin	August 27	Monday
Recess	November 17–15	Saturday–Sunday
Fall Semester Ends	December 21	Friday
	December 22–January 20, 1974	
Intersession		Saturday–Sunday
Spring Semester Begins	January 21	Monday
Spring Recess	March 16–March 25	Saturday–Monday
Spring Semester Ends	May 31	Friday
Graduation	June 1	Saturday



INTRODUCTION



INTRODUCTION

COLLEGE GOALS

Professional forestry education in America is almost entirely a development of the present century. There were only two schools of forestry in this country before 1900, both founded in 1898. But forestry education did not spring into existence full-blown. The generation that produced the "muck-rakers" was also the generation that produced the surge of interest in the conservation, preservation and careful management of America's resources. It was in this period of concern that the College of Forestry was established in 1911 to provide technical professional education as preparation for young people in the national evolution of attention to the environment.

From the beginning, the College avoided specialization and responded liberally to the broad needs of environmental professionalism expressed in its charter.

The College of Environmental Science and Forestry responds to the national environmental needs through education, research and public service. First of all, it seeks to develop, through general education and through concentration in the physical, engineering, biological and social sciences, educated men and women capable of creative and responsible contributions to the management and use of forests and related resources. The College also aims to prepare, through intensive training in field and forest, competent paraprofessionals whose practical knowledge and command of current techniques support and complement professional activity.

Secondly, the College's goal is to create, through research, new understanding of the social and ecological systems that dominate resource development and use, and new control techniques that can be employed to improve human life styles and standards.

Lastly, the College seeks to promote, through public education, widespread understanding of the role that forests play, and to stimulate through individual and community action, future forest contributions.

ORGANIZATION

The College of Environmental Science and Forestry was founded as a State College, and, in its more than 60 years of State service, it has become the largest and one of the leading forestry colleges in the Nation. The College has graduated more than 6000 professional students at the Baccalaureate and graduate level degrees; in addition, over 2500 forest technicians have been trained in this period at the College's Ranger School. When the State University of New York was created by the Legislature in 1948, the College became a specialized unit.

In 1972, by special legislative act, the College of Forestry was renamed the State University of New York College of Environmental Science and Forestry to indicate more clearly the traditional grounding and concern of forestry in the environment. The President is the chief executive officer of the College, and is governed by policies established by the College of Environmental Science and Forestry Trustees and the State University

Trustees. Because of the cooperative relationship with Syracuse University, a close liaison is maintained with its Chancellor and other administrative officers.

Administratively, the College is organized into five Schools which illustrate the variety of programs available to students. On the Syracuse Campus the Schools are: Biology, Chemistry and Ecology; Environmental and Resource Engineering; Environmental and Resource Management; and Landscape Architecture. The fifth is the Ranger School, located on the Wanakena Campus near Wanakena, New York.

PROFESSIONAL EDUCATION

At the Baccalaureate level the College provides instruction for professional study in 7 four-year curricula, some of which contain optional programs. Each curriculum leads to the Bachelor of Science degree. In the case of one, a fifth year leads to the Bachelor of Landscape Architecture degree. In the Forest Engineering program, a fifth year leading to a Bachelor's in Civil Engineering can be taken at adjacent Syracuse University. A minor in Environmental Studies may be elected in several curricula. Students enter both at the freshman level and as transfers at the sophomore and junior levels in about equal numbers. Scholarships are available for special students. Detailed descriptions of undergraduate programs are given in Chapter VIII.

At the graduate level the College offers programs in 14 major disciplines or interdisciplinary areas in forestry, forest products, engineering, landscape architecture and the science disciplines related to natural resources. Graduate study leading to the Master's degree and Doctor of Philosophy degree began when the College was founded. The first advanced degree was awarded in 1913. Since then, graduate enrollment has increased steadily and now exceeds 300 students per year. More than 1500 advanced degrees have been awarded by the College. The College awards a substantial number of scholarships, fellowships and assistantships annually to graduate degree candidates. Graduate study and programs are detailed in Chapter X.

A postdoctoral study program is also available with about 12 participants enrolled at the College each year. This program is closely related to the College's research effort.

TECHNICAL EDUCATION

The College has been training men for technical forestry careers since 1912 at the Ranger School on the Wanakena Campus at Wanakena, N. Y. It is situated on 2800 acres of forested land near Cranberry Lake in the Adirondack Mountains. The Ranger School offers a two-year Associate in Applied Science degree program in practical forestry at the paraprofessional level, training individuals for positions as state forest rangers; Federal, state, and private industry forest technicians and forestry aides; company district forest supervisors; timber inventory specialists; timber sales supervisors; forest surveyors and engineering aides; forest protection technicians; and other position opportunities.

The program of study is a 1 + 1 program with one year in general and background studies taken on the Syracuse Campus or at one of the various two-year colleges, followed by two semesters of intensive class and field training on the Wanakena Campus. The second year of the program is practical and intensive, and deals with such activities as forest surveying, timber estimating, mapping, log and pulpwood scaling, tree identification, forest facilities, logging, silviculture, aerial photogrammetry, allied technologies and wood identification. The program is discussed at length in Chapter VII.

RESEARCH

The College enjoys the excitement and ferment of a burgeoning research program. The wide panorama of inquiry embraces the physical, biological, ecological, behavioral, social and management sciences; environmental design, engineering and interdisciplinary work in environmental science and in forestry. The program has attracted a world-wide clientele of industrial, governmental, professional and scientific groups, and through liaison with them, College research maintains its vigor and relevancy to the important issues of the decade. Support from this clientele currently amounts to approximately \$2.5 million per year.

Students and faculty from all departments of the College community contribute to the depth and diversity of the program. The strengths are drawn from the College's Schools of Biology, Chemistry and Ecology; Environmental and Resource Management; Environmental and Resource Engineering and Landscape Architecture, and from organized research units. Special research and public service responsibilities rest with the Institute of Environmental Program Affairs. This unit coordinates and programs investigative endeavors of the College. Included, in addition to the School programs, are those of the Empire State Paper Research Institute, the Applied Forestry Research Institute, the State University Polymer Research Center, the Adirondack Ecological Center, the Cellulose Research Institute, and the recently-approved Social Policy Institute.

Augmenting the College program is its relationship with the Northeastern Forest Experiment Station of the U. S. Forest Service which maintains a center for recreation research at the College for the Northeastern Region of the United States. Forest Service personnel collaborate directly with faculty and students on research and graduate study in this new area of resource management.

Important to the research program is the College's demonstration and information function which transforms research findings into professional practice applications. Recent examples of this program have provided land-use information for a New York State Commission, formed the foundation for polymeric materials for artificial human organs, provided natural products which may have implications for solutions to human diseases including cancer and leukemia, alternative control measures for disastrous insect pests and new pulping processes leading to pollution-free water and air effluents.

*Bray
Hall*



*Illick
Hall*



*Walters
Hall*



PUBLIC SERVICE AND CONTINUING EDUCATION

In looking to the future, the College is aware of society's increasing interest and concern with natural resources, the quality of man's environment, the near crisis in water resources, and the need for greater outdoor recreation opportunities. This trend has been called "a growing resource ethic" — an awareness of the obvious and subtle relationships between man and his natural environment, and a desire to enhance them.

The College, accordingly, has recently reorganized its internal structure to provide even greater opportunity for instruction, research, and public service directed towards environmental concepts and issues. Early in 1973, the Board of Trustees approved the creation of a new School of Continuing Education. It will represent a consolidation of current programs in continuing education, and place increased emphasis on the concept of life-long learning. Furthermore, a number of changes have been made in the curricula of the four schools within the College, which, in turn, permit greater emphasis on environmental courses as part of the continuing education offerings of the College.

Public service and continuing education activities are functions of the College faculty, individually and collectively. By virtue of this professional richness and depth, the College has the expertise to draw upon the biological, physical, and environmental resources management sciences required to meet its broad responsibilities for public information and education in response to the needs of society on a statewide, national, and international basis.

Presently, the College's Office of Public Service and Continuing Education coordinates efforts to provide information, advice, and guidance to specialized local, state and Federal agencies, to the forest and wood-using industries, and to the general public on matters relating to the conservation and wise use of forest resources.

Continuing education programs are designed to serve needs in two broad areas: refresher courses to up-date and up-grade professional foresters, technicians and forest industries personnel in the management, production, and multiple-use aspects of forestry; and secondly, informational programs which play a vital role in closing the gap between new knowledge and the educational needs of policy planners, civic leaders, school teachers, and the general public.

Public service efforts involve the use of various media and methods. A motion picture film library with supporting production facilities provides films on environmental and forestry subjects. A wide range of College publications, both technical and popular, are available on request, and mass communications techniques, including a speakers' bureau, exhibits, tours, and radio and television programs, are used to reach a broad clientele. Technical advice and guidance are provided to other Federal, state, and local agencies concerned with environmental and resource management and to the wood-using industries of the state in order to improve the products, benefits and services required to meet the ever-increasing demands of society.



Marshall Hall



Baker Laboratory

STATE UNIVERSITY OF NEW YORK

State University of New York, which celebrates its 25th anniversary in 1973, is unique in its organization and the breadth of its educational mission. It is the largest coordinated, centrally managed multi-level system of public higher education in the nation.

In a recent report to the University's Trustees, Chancellor Ernest L. Boyer said, "The State University welcomes not only the future architects, business executives, engineers, surgeons, and literary critics, but also future dairy farmers and medical technicians, accountants and social workers, foresters and automobile mechanics. And, through work in film, electronics, pollution control, data processing, police science, urban studies and similar fields, the University seeks to educate persons for tomorrow's roles as well as those of today."

Since its founding in 1948, the State University has grown from 29 State-supported but unaffiliated campuses into an organized system of

higher education comprising 72 institutions which enrolled 234,000 full-time and 127,000 part-time students in academic 1972-73.

Specifically, the University encompasses four university centers (two of which, Buffalo and Stony Brook, include health science centers); two medical centers; 13 colleges of arts and science; a nonresidential college; three specialized colleges; six agricultural and technical colleges; five statutory colleges; and 38 locally-sponsored community colleges. Together, they offer students a choice of more than 3,100 academic specializations, representing more than 1,500 different degree programs. Twelve of the campuses offer graduate study at the doctoral level, 22 at the master's level.

Advanced degree study encompasses a wide spectrum, including agriculture, business administration, criminal justice, dentistry, education, engineering, forestry, life and physical sciences, medicine, nursing, optometry, pharmacy and veterinary medicine.

Four-year programs emphasize the liberal arts and science and include such specializations as teacher education, business, forestry, physical education, maritime service, ceramics and the fine and performing arts.

The two-year colleges offer associate degree opportunities in arts and science and in technical areas such as agriculture, business, civil technology, data processing, police science, nursery education, nursing, medical laboratory technology and recreation supervision. The two-year colleges also provide transfer programs within the University for students wishing to continue study toward a baccalaureate degree.

Responding to the needs of New York State's economically and educationally disadvantaged, State University has also established six urban centers and six cooperative college centers. The former provide training for skilled and semi-skilled occupations as well as college foundation courses for youths and adults in inner-city areas. The latter combine the resources of public and private colleges within a region in a joint effort to prepare students for full-time college programs.

Educational innovation has from the first been a University watchword.

With funding support from a private educational foundation, six of the University's senior campuses are experimenting with programs to shorten substantially the traditional four-year period of baccalaureate study.

Empire State College, the 72nd and newest institution, is a non-residential college whose students earn degrees without being attached to a specific campus or attending traditional classes. Its coordinating center at Saratoga Springs reaches out to students through regional learning centers.

State University is governed by a Board of Trustees, appointed by the Governor, which determines the policies to be followed by the 34 State-supported campuses.

The 38 community colleges operating under the program of State University have their own local boards of trustees. The State contributes one-third to 40 percent of their operating costs and one-half of their capital costs.

The State University motto is "Let Each Become All He Is Capable of Being."

THE COLLEGE COMMUNITY



THE COLLEGE COMMUNITY

ENVIRONMENT

The College's campus adjoins that of Syracuse University on one of the hills which overlooks the City of Syracuse. The campus is a 20-minute walk from downtown, and nearby are the city's major hospital complexes, a small shopping district primarily serving the student community, a city park and private residences.

The City of Syracuse is the core of an urban-industrial region of nearly 500,000 people. Numerous manufacturing firms apply modern technology in electrical, chemical, mechanical, metallurgical, and biological fields.

Syracuse, located near the geographical center of New York State, is readily accessible by car via modern highways. North-South travel is provided by Interstate Route 81; East-West travelers generally use the New York State Thruway which connects with major expressways serving New England and the Midwest. The city also is served by a modern international airport and major bus and rail lines.

Both the City of Syracuse and Syracuse University offer varied cultural and recreational opportunities, including exhibitions of paintings and sculpture, recitals and concerts, amateur and professional theater, dance and cinema, lectures in the humanities, forums and addresses by political and social scientists. The annual Arts Festival is among the special attractions of the campus.

Among the city's cultural assets are the Syracuse Symphony Orchestra and the Everson Museum of Arts of Syracuse and Onondaga County, both with a fine philosophy of community service and participation.

Recreation opportunities are varied because of the central New York climate and geography. General facilities for winter and summer sports are enjoyed by residents and students. The City of Syracuse and Onondaga County have extensive park systems, and State parks are nearby. The Finger Lakes Region begins 18 miles away, and the Thousand Islands are 90 miles from Syracuse. The Adirondack and Catskill Mountain Parks and Niagara Falls are within 150 miles.

CAMPUS SYSTEM

The College has a regional campus system of six campuses located at Syracuse, Tully, Wanakena, Cranberry Lake, Newcomb, and Warrensburg. This system is composed of about one-million square feet of facilities and 25,000 acres of land. All of these campuses are used to support the instruction, research, demonstration and public service programs of the College.

The main campus is at Syracuse. It contains about three-fourths of the major academic facilities even though its 12 acres make it the smallest campus in size. A 44-acre experiment station is also located in Syracuse and is a few minutes drive from the main campus. On the Syracuse Campus are the following institutes and centers: Cellulose Research Institute, Empire State Paper Research Institute, State University Polymer Research



Moon Library

Center, and the Applied Forestry Research Institute. A research center of the U. S. Forest Service is also located at the College.

The Tully Campus is composed of the Heiberg Memorial Forest and a Genetic Field Station. The Wanakena Campus supports the Ranger School Forest Technician Program and has a major instructional and demonstration forest. The Cranberry Lake Campus is the home of the Cranberry Lake Biology Station and one of the two Charles Lathrop Pack Demonstration Forests. The Newcomb Campus contains the Adirondack Ecological Center and the Huntington Wildlife Research Station. The Warrensburg Campus is the site of the second Charles Lathrop Pack Demonstration Forest and is a permanent host to the summer session in Field Forestry.

SPECIALIZED FACILITIES

The College is extensively furnished with modern equipment and instruments for instruction and research in its major subject areas. These include electron microscopes, plant growth chambers, air conditioned greenhouses, an animal environmental simulating chamber, a bio-acoustical laboratory, a 1,000-curie cobalt-60 radiation source, radioisotope laboratory, computer center, and specialized instrumentation including nuclear magnetic resonance, electron spin resonance, mass spectrometer, ultracentrifuge, X-ray and infrared spectrophotometer. Photogrammetric and geodetic facilities of the Forest Engineering Department include one of the most extensive arrays of equipment in the United States, with a Nistri TA-3 stereocomparator, Mann comparator, computerized Nistri photocartograph, and nine other varieties of plotters. The paper science and engineering laboratory has a semicommercial paper mill with accessory equipment. The Wood Products Engineering Department has a complete strength-of-materials laboratory as well as a pilot scale plywood laboratory and a machining laboratory. The greenhouses and forest insectary are used to

produce plant and insect material for classroom and laboratory. Extensive collections are available for study, including wood samples from all over the world, botanical materials, insects, birds, mammals, and fishes.

LIBRARY

The F. Franklin Moon Library contains more than 60,000 cataloged items. Over 800 journals and corresponding indexes are currently received. The collections constitute an information center for forestry and environmental science programs in ecology, botany and pathology, biochemistry, chemical ecology, forest chemistry, polymer chemistry, economics, entomology, environmental studies, industrial pollution abatement, landscape architecture, environmental design, management, paper science and engineering, photogrammetry, silviculture, soil science, water resources, world forestry, wildlife biology, wood products engineering, and zoology. These are supplemented by large collections in the environmental resource field. Additional strength is found in the comprehensiveness of abstract and indexing services relevant to the College's programs. The Library also offers a selected and broad choice of general-interest reading material.

The collections of Syracuse University Libraries and S.U.N.Y. Upstate Medical Center are within walking distance. They may be used by all members of the College of Environmental Science and Forestry. Arrangements can often be made to use industrial libraries in the Syracuse area. Other collections are accessible through the Interlibrary Loan privilege.

The library building, opened in 1968, can accommodate 132,000 volumes and can seat 575 persons. The main reading areas are in the center of the upper level surrounding open stacks, a Current Periodicals Room, Bibliographic Center, individual study carrels and library staff offices. The Reserve Book Room, Archives, Special Collections, Conference Rooms, and Auto-tutorial Center are located on the lower level.

The Auto-tutorial Center provides facilities for study with nonbook materials. Slides and cassettes prepared as integral units of particular courses are held on reserve for use in the Center. Materials are available for review on weekends, evenings, and times when other facilities are closed.

The leisure reading collection also includes the Robin Hood and Raymond F. Crossman collections, which contain works on national and world social problems, humanities, education, and popular books concerned with the environment. The Archives consists of historical items relevant to the College and forestry developments in New York State. The Special Collections Room contains many rare and valuable books and folios.

Reference service and orientation sessions are provided by the librarians. A library handbook is published annually and a list of recent acquisitions is distributed frequently.

The Ranger School on the Wanakena Campus has a small library of approximately 1500 volumes. This collection consists of highly specialized materials required for the teaching and study programs of the school. Other Schools also maintain small collections of special resource books and materials.

STUDENT LIFE





STUDENT LIFE

EXTRACURRICULAR ACTIVITIES

Students at the College of Environmental Science and Forestry have many extracurricular activities from which to choose. They participate in the election of class officers and the Student Council, the official representative body governing extracurricular student affairs.

The campus has two major student publications: *THE KNOTHOLE*, produced entirely under a student staff, appears weekly during the academic year containing news and student opinion. The *EMPIRE FORESTER*, with a long tradition of excellence, is the College yearbook. It is published by a student staff with a faculty advisor.

Several professional and departmental organizations offer to students opportunities to broaden their knowledge and to become acquainted with students having similar interests. These groups include Archery Club, Bob Marshall Club, Botany Club, Forest Engineers Club, Forestry Club, Mollet Club (landscape architecture), Papyrus Club, Wood Products Engineering Club, Forest Zoology Club, and the student chapters of the Wildlife Society and the Society of American Foresters.

Other organizations at the College include, *Vox Silvae*, an organization aimed at improving public-speaking ability through debate; Saengerbund, the College glee club; Robin Hood, the all-College junior honorary society; and Alpha Xi Sigma, the senior honorary society devoted to main-



taining the high standards of scholarship, leadership and services of the College.

SYRACUSE UNIVERSITY

The College of Environmental Science and Forestry lies adjacent to the Syracuse University campus and since the College's founding in 1911, there has been a close association between the state-operated specialized school and the large private institution. Students at the College have all the privileges of Syracuse University students; participation in student government, organizations and other extracurricular activities is open to them.

LIVING ON THE SYRACUSE CAMPUS

Residence in a Syracuse University living center or an approved sorority house (upperclasses only) is required of all unmarried freshman and sophomore women under 21 years of age, although permission may be secured from the Office of Residential Life to live with blood relatives if the parents are willing to transfer all responsibility for the student to the relative concerned. Any exceptions to this requirement are listed in the Room and Board Agreement.

All unmarried freshman and sophomore men under 21 years of age are required to live in University dormitories, and the University accepts the responsibility for this housing (dormitories or fraternities). Any exceptions



to this requirement are listed in the Room and Board Agreement.

Syracuse University housing units are available for married students. Veterans are given preference, but there are ordinarily apartments for non-veterans.

ATHLETIC FACILITIES

Payment of a student athletic fee entitles students to admission to University home athletic events upon presentation of the official identification card, and the same applies to full-time graduate students.

Athletic facilities for men include Archbold Gymnasium, which houses basketball courts, handball and squash courts, a rifle range, rowing tank, and a champion-size swimming pool. A ski tow and lodge on University property at Skytop are centers of much interest and recreation during the winter. There are 22 tennis courts at the University. The Manley Field House provides indoor practice facilities for many sports, including football, baseball, track, and lacrosse, and is the site of home basketball games.

Sports and dance activities for women offer the opportunity to acquire skill and understanding of these activities through the Department of Physical Education for Women.

COLLEGE SERVICES

Academic and Personal Counseling

The Office of Student Affairs is available throughout the student's college career as a place where he may seek, at any time, the advice of experienced counselors. This office should be the first contact when questions or personal problems arise. General advisement for foreign students is

provided by the Office of International Forestry. The Registrar in the Student Affairs Office is available as needed to provide information and guidance on general academic and specific program requirements. In addition, the Coordinator of Financial Aids in the Student Affairs Office provides information on available scholarships, long-term state and Federal educational loans, work opportunities at the College and major financial problems.

Traditionally, the College faculty has placed emphasis on academic advisement both formally and informally to meet individual student needs and considers this close faculty-student association to be a major academic strength. During registration the student is assigned to a faculty advisor to assist him as needed in his curriculum decision, program development, and elective decisions. In curriculum selection, special advisors are assigned to provide academic advice as needed. Faculty in the major departments are available also for academic guidance. In addition, many classes are small, permitting students ample opportunity to discuss their courses and professional aspirations with instructors. While advice and counsel are available on an individual basis as needed, students at the College are encouraged early in their careers to become independent and responsible for their academic decisions as will be required in later professional life.

Other Counseling

Full-time ministries are provided in all the major religious groups. They center their programs at Hendricks Chapel, except for Roman Catholics, who are served at Saint Thomas More Chapel. The Dean of Hendricks Chapel coordinates religious activities, working with eight full-time and six part-time denominational chaplains and advisors. The program of Saint Thomas More Chapel is under the direction of a chaplain.

Extracurricular activities are under the guidance of a faculty committee, the members of which meet with students during planning sessions and offer their counsel when necessary.

Resident counselors are located in all University dormitories, and are available for assistance if needed.

As students reach the end of their undergraduate years, they often seek career guidance. Highly motivated students should consider the question of whether or not to continue their education in graduate school. At the College, this sort of counseling is handled by the departments or divisions in which the major work is taken. At the completion of the student's college career, placement counseling is available.

Health and Medical Facilities

Students may consult a physician for medical care or health advice at the Syracuse University Student Health Service, and are entitled to unlimited visits to the out-patient clinic and also 10 days of confinement per college year with ordinary medical care in the Infirmary. Infirmary usage over 10 days will be at prevailing Infirmary rates. The usual laboratory examinations, if necessary for treatment or diagnosis of common illness, are

usually provided without cost. Most common legal drugs are provided without extra charge.

A student accident or sickness insurance plan is available and not only supplements the usual Infirmary privileges, but is also a health protection during the summer months when students are not under care of the Health Service. Married students with dependents who are not covered by Health Service privileges are strongly urged to provide themselves and their families with special insurance made available to University students. *All foreign students are required to carry health and accident insurance.* Graduate student insurance requirements are explained in Chapter X.

Military Service

The Registrar's Office keeps on file up-to-date information on Selective Service. Students reaching 18 years of age after arriving in Syracuse may register with Selective Service in the Office of Student Affairs.

Air Force and Army Reserve Officer Training Corps programs are available; however, a minimum of two years is required.

Hearing and Speech Center

The Gordon D. Hoople Hearing and Speech Center provides remedial assistance to all regularly enrolled students who may be handicapped by hearing, speech, and voice disorders. This service is without expense to students.

Psychological Services and Research Center

Students desiring an analysis of their aptitudes, abilities, and interests may secure special testing programs at the Testing and Evaluation Service Center on the Syracuse University campus.

Reading Research Center

The School of Education, in cooperation with the College of Liberal Arts and the Psychological Services and Research Center, maintains a reading laboratory for research in the learning skills and for training teachers and specialists in reading. Representatives from the fields of medicine, speech, and psychology cooperate in making diagnoses and in planning remediation. Large numbers of University students use this facility to improve their reading skills.

COLLEGE REGULATIONS

The complete rules and regulations governing all students while attending the College of Environmental Science and Forestry, and residing on the Syracuse University Campus, are included in a separate publication entitled *Undergraduate Student Handbook*. It may be obtained from the Office of Student Affairs, and is distributed to students at registration. However, it is the student's responsibility to secure a copy and become thoroughly familiar with it.

IV

ACADEMIC LIFE



ACADEMIC LIFE

STUDENTS AND FACULTY

Education in the classroom, laboratory and field is a cooperative endeavor between students and faculty, and is an enriching experience for both. This two-way communication is traditional at the College, so much so that Deans and Department Chairmen, with considerable administrative duties, still meet classes and consider it a privilege to do so.

Men and women are enrolled as students at the College, and in the Fall, 1972, numbered 1783. Of these, 1464 are undergraduates and 319 are graduate students. In addition, there are 12 students engaged in post-doctoral work. A growing number of students at the College transfer here from community colleges and other institutions, and international students are encouraged to apply for admission. For detailed information on pro-



cedures, incoming freshmen, international students and transfer students should consult the Admissions chapter on page 30. Forest technology students should see the admissions section in Chapter VII. Graduate students should refer to Chapter X.

The teaching and research faculty number 175. Selected professors are designated as graduate faculty, but they also teach undergraduate courses and are available for undergraduate consultation. Many of them serve as advisors to undergraduates which is particularly helpful to students seeking advanced degrees.

ORIENTATION

To ease the adjustment to college life, *all freshmen and new transfer students* are required to attend an orientation period during registration week of the Fall semester. This is an opportunity for new students to meet classmates and members of the faculty and administration. It is also a good



way to become acquainted with the College, its functions, operations and services. A special orientation session for foreign students is provided through the Office of International Forestry.

A weekly one-hour orientation course, *General Forestry 032*, is required throughout the first semester for all freshman students, including freshman transfer students. The purpose of this course is to introduce the new student to the College standards, counseling services and general College policy.

ACADEMIC REGULATIONS

Course Selection

Courses are to be chosen in accordance with the regulations of an established degree program, and it is the student's responsibility to plan his program so that all degree requirements are met.

Course Load

Normally, a full-time undergraduate student will register for a minimum course load of 15 to 18 hours. The average freshman spends about 24 hours a week in class, and at least the same amount of time in out-of-class study.

Late Registration

A student who fails to report for registration, or fails to complete registration during the authorized period, is subject to a penalty unless excused by the Vice President for Student Affairs or his representative.

Assignment of Grades

In each course final grades are given at the end of the semester and are expressed in letters as follows: A—excellent, B—good, C—average, D—minimum passing, F—failure, INC—incomplete, and in theses courses, S—satisfactory, U—unsatisfactory. An incomplete must be made up within one semester or an F is recorded.

Grade-Point Average

For the purpose of determining grade-point averages, letter grades have the following values: A, 4 points for each semester hour; B, 3 points for each semester hour; C, 2 points for each semester hour; D, 1 point for each semester hour; and F, no points. Both semester and cumulative scholastic averages are computed by dividing the total grade points accumulated by the total credit hours carried. Only courses carried at the College of Environmental Science and Forestry or Syracuse University, including Utica College and University College, are used to compute grade-point averages.

V

ADMISSION



ADMISSION

ENTERING FRESHMEN

To apply for admission, residents of New York State should request the proper forms from their local high school guidance office. Nonresidents should request them directly from the College's Office of Admissions. *In either case, however, the applicant must obtain directly from the Office of Admissions supplemental forms in addition to those obtained from guidance counselors.*

This material will arrive after a period of three to four weeks. Revised admission forms are available in September for entry the following year.

Admission to the College will be based on academic qualifications after careful analysis of data provided by high school or other scholastic records, standardized tests, and school recommendations. In many cases an interview may be held to assess interests and scholastic abilities.

Minimum requirements are at least 16 units as follows: English, four units; history (social studies), two units; science (at least one unit in chemistry or physics), two units; mathematics (through trigonometry), three units; and electives, five or more units. A foreign language and mechanical drawing are recommended electives.

The date for final decision on most freshman applications for August entry is May 1. Freshman applicants will begin to receive notification of admissions decisions after February 15; a copy of the decision letter is sent to the applicant's high school guidance office. Freshmen are not usually admitted to the College in January.

APPLICATION DEADLINE FOR FRESHMAN ADMISSIONS IS MARCH 1.

Applicants for graduate study at the College should turn to the admissions information section in Chapter X. Applicants for the Wanakena program of Forest Technology should turn to Chapter VII.

TRANSFER STUDENTS

Students with previous college experience or who are currently enrolled at another college may apply for transfer. It is College policy that any student who is academically dismissed must wait at least one semester before applying to this College.

Applications should be obtained directly from the College by writing to the Director of Admissions, Attn: Transfer. Allow three to four weeks for delivery of this material. Revised application forms are available in September for admission the following year.

Students with two years of college can generally arrange their programs to allow transfer to the College of Environmental Science and Forestry with a junior standing. Courses transferred for credit must be appropriate to the student's curriculum choice and successfully completed with a passing grade (D or better)*. In addition, courses to be transferred as required courses

*Note: Students who transfer courses in which a grade of "D" has been earned must be aware of possible deficiencies when that material is used in upper division classes.

in a curriculum must be comparable in content. Course credit hours are transferred, but grades and grade points are not transferable.

In applying to the College for transfer, it is the student's responsibility to submit a recent official transcript from the college he is currently attending, and similar documents from all colleges previously attended. Also, a catalog from each college may be required.

APPLICATION DEADLINE FOR TRANSFER STUDENTS IS MAY 15.

INTERNATIONAL STUDENTS

The College accepts international students on the undergraduate level if they can satisfy all regular admissions requirements. It is recommended, however, that students from foreign countries obtain their baccalaureate degree in their home country if at all possible and apply to the College as a graduate student. Experience has shown that this arrangement provides for greater academic achievement and more efficient use of the student's time and funds. If an international student wishes to apply as an undergraduate, he must meet the secondary school requirements for entrance; show that he is proficient in the English language through acceptable results of the TOEFL test and/or College Entrance Examination Board Achievement Test in English; provide competitive scores on the C.E.E.B.'s Scholastic Aptitude Test in the verbal and math areas; and produce evidence that he can meet all financial obligations.

Undergraduate foreign students must file official State University of New York admissions forms. These may be obtained by writing to the Director of Admissions at the College. No fee is required for processing the application. *If the foreign student is accepted, he must obtain adequate health and accident insurance before he will be allowed to register at the College.*

International students who are currently enrolled at an American college may apply for transfer to the College. They must meet all regular entrance requirements plus those of a transfer student as listed on page 30. Permission to transfer must be obtained from the U. S. Immigration and Naturalization Service district office having jurisdiction over the college in which the student is currently enrolled.

ADMISSION EXAMINATION

State University of New York requires resident applicants to take the New York Regents Scholarship Examination (administered only in early October in most high schools in New York) if the applicant is residing or attending school in the State during the year prior to entrance to college. If an applicant does not take this test, he must submit the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB) or the American College Test (ACT). The College Director of Admissions may waive the requirement for (1) applicants from outside New York State, who must substitute scores earned in the Scholastic Aptitude Test of the College Entrance Examination Board, or the American College Test, (2)

late applicants, and (3) applicants for admission as transfers from another college.

HEALTH EXAMINATION REPORT

Each new student is required to submit a history and physical examination report on a form that will be sent after the initial acceptance notice. *It is to be completed and returned within two weeks to the Admissions Office, State University College of Environmental Science and Forestry, Syracuse, New York 13210.*

ENTRANCE WITH ADVANCED STANDING

Secondary school students may earn college credit toward the B.S. or B.L.A. degree before enrolling as freshmen at the College. This enables students to carry enriched course loads, and may be accomplished in two ways:

1. Courses in mathematics or English, for instance, given by a nearby college may be open to recommended high school seniors. After successful completion, an official transcript or other appropriate document should be sent to the College by the institution along with a catalog description of the course or courses.

2. College-level courses are given by some high schools in the Advanced Placement Program of the College Entrance Examination Board to recognize and develop academic talent. Such courses as biology, mathematics, chemistry, English, and foreign languages offer opportunity for degree credit at this College. The determination of credit is made by faculty members to whom the student's final examination papers are sent after they have been graded.

COLLEGE PROFICIENCY EXAMINATIONS

The New York State College Proficiency Examination Program is a means by which students may receive college credit for specific courses by examinations, without being in residence for a course or taking structured correspondence lessons. The College also accepts the College Level Examination Program (CLEP) of the College Entrance Examination Board. These examinations are open to all who make application.

The College approves of the CPE and CLEP programs in general and will evaluate the performance of participants. Satisfactory performance by a student must be demonstrated during at least one semester in residence at this College before granting credit. This residence may be prior or subsequent to the examination.

If all College policy requirements are met, grades A and B will receive credit; credit for a grade of C will be granted only upon recommendation of the department of the applicant's major; and no credit will be granted for a grade lower than C.

Application for credit should be made to the Office of Student Affairs. Application for deviation from the prescribed policy may be made to the Academic Standards Committee for undergraduate credit and the Committee on Graduate Studies for graduate credit.

STUDENT EXPENSES



STUDENT EXPENSES

TUITION AND FEES

The tuition and fee structure at the College of Environmental Science and Forestry includes library, health, infirmary, physical education, R.O.T.C., special testing and other services, as well as an assessment for student activities and charges for expendable supplies and equipment. A nonrefundable application fee is required, for which each applicant will be billed after receipt of the application. No fee is required of transfer students from other units of the State University of New York.

Graduate students should refer to the section on tuition and fees in Chapter X.

Tuition

Residents of New York State

Lower Division (freshmen, sophomores)	\$325.00 per semester
Upper Division (juniors, seniors)	\$400.00 per semester

Nonresidents

Lower Division	\$537.50 per semester
Upper Division	\$650.00 per semester

Student Activity Fees

College of Environmental Science & Forestry	\$ 10.00 per semester
Syracuse University (Full-time)	\$ 18.00 per year
Syracuse University (Part-time)	\$ 9.00 per year
Syracuse University — PIRG (Optional)	\$ 3.00 per year

Advanced Payment Fee

This payment is for new and transfer students alone, and it will be credited to the student's first semester tuition. The advance payment should be mailed to the Business Office, College of Environmental Science and Forestry, Syracuse, N. Y. 13210, along with the form provided by the Admissions Office. The payment of \$50 is required within 30 days after the date of acceptance and no later than May 1; it is refundable up to May 1.

OTHER COSTS

A commencement fee of \$10 is required at the beginning of the semester in which the degree is expected.

Housing costs at Syracuse University range from \$640 to \$790 for an academic year, depending upon the type of room. Most rooms are for two students and are furnished with beds, mattresses, desks, chairs, study lamps, and dressers. A commercial linen service operates on campus and is available for those who order it.

Board costs at Syracuse University range from \$550 to \$750 for an academic year. A variety of options on board offerings are available for all students. Housing and board rates are subject to change and inquiries about

them should be sent to: Office of Residential Life, Syracuse University, Syracuse, N. Y. 13210.

Other expenses include books and supplies (approximately \$75 per semester) and personal expenses such as laundry, linen service, travel, and entertainment. Resource Management majors must attend a five-week Summer Session in Field Forestry between the sophomore and junior years (approximately \$175). Forest Biology majors must attend either the Summer Session in Field Forestry or the Summer Session in Environmental Biology (Cranberry Lake Biological Station) which costs approximately \$450 for the eight-week session. Extended field trips lasting up to three weeks for Landscape Architecture and Wood Products Engineering students range in cost from \$100 to \$200.

TERMS OF PAYMENT

A check or money order for tuition and fees should be made payable to "State University College of Environmental Science and Forestry," and payment is made at the Business Office of the College. Payment is required by the last day of the registration period and can be paid either prior to registration or during registration. The College does not provide advance billings of tuition and fees.

Payment for housing and board is made directly to Syracuse University (except for the Ranger School).

REFUNDS

The following policies shall apply to tuition liability and refunds for students canceling their registration.

A student who is given permission to cancel his registration shall be liable for payment of tuition in accordance with the following schedule:

<i>Liability During</i>	<i>Semester</i>
1st week	0
2nd week	30%
3rd week	50%
4th week	70%
5th week	100%

No money shall be refunded unless application for refund is made within one year after the end of term for which the tuition requested to be refunded was paid to State University. The first day of class session shall be considered the first day of the semester and Saturday of the week in which this first class session occurs shall be considered the end of the first week for refund purposes. It is interpreted that a student who does not attend any class sessions after Saturday of the first week and who notifies the College of his intent to cancel registration on or before the second Saturday following the first day of classes shall be considered to have canceled his registration during the first week.

There shall be no tuition or fee liability established for a student who

withdraws to enter military service prior to the end of an academic term for those courses in which he does not receive academic credit.

A student who is dismissed for academic or disciplinary reasons prior to the end of an academic term shall be liable for all tuition and fees due for that term.

A student who cancels his registration at a unit of the State University, and within the same term registers at another unit of the State University, shall be entitled to full credit for tuition and fees paid for that term.

Notwithstanding any other provisions for refund, when a student has withdrawn through circumstances beyond his control, under conditions in which the denial of refund would cause undue hardship, the Chief Administrative Officer of the unit, may, at his discretion, determine that no liability for tuition has been incurred by the student, provided the student has not completed more than one half of the term and has not received or will not receive academic credit for the term. Such action, including the reason for withdrawal, shall be in writing.

FINANCIAL ASSISTANCE

The College administers various types of scholarships and grants, loans and part-time employment opportunities. These programs are coordinated to supplement parental support, summer work, savings and assistance granted from other sources.

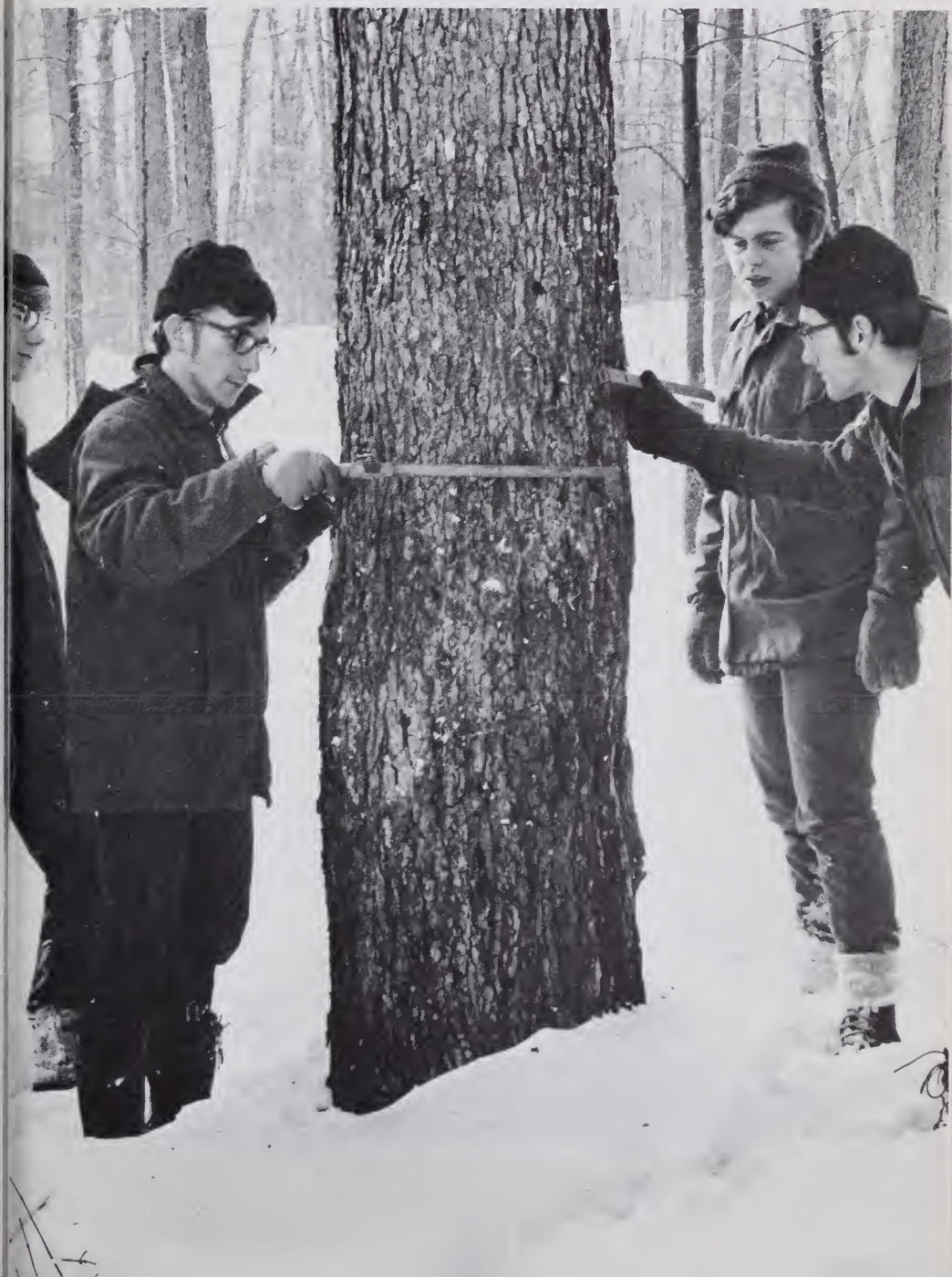
Complete information and an application for financial aid is available from the Office of Financial Aid at the College. Most of the programs administered by the College require a *Parents' Confidential Statement* (PCS) to be completed. These forms are available at most high school guidance offices, or can be obtained from the Office of Financial Aid.

Incoming students should apply for financial aid when they apply for admissions. All students who apply will be notified of the decision made by the Awards Committee. The review of applications begins in April.

The following assistance programs are administered by the College: Alumni Memorial Awards, Alumni Grants, College Work-Study Program, National Direct Student Loans, tuition waivers for foreign students, State University Scholarships, Friedrich U. Klaehn Memorial Scholarship in Silviculture, David B. Schorer Memorial Fund, Edward Vail Emergency Fund, Boston Paper Trade Association Scholarship, Phyllis Roskin Memorial Award, State University at Syracuse Chapter of CSEA Scholarship, and the Student Association Grants.

Other opportunities include: Allied Paper Salesmen's Association Award, Harold L. Austin Memorial Scholarship, Boxboard Research and Development Scholarship, Nelson Cortlandt Brown Scholarship Fund, Henry H. Buckley Student Aid Awards, Geigy Dyestuff's Scholarship, C. E. Libby Award, Milton Conservation Club Award, Frank B. Myers Memorial Award, New York-Canadian Division of Paper Industry Management Association Scholarship, Pen-Jer-Del Division of the Paper Industry Management Association Scholarship, Plastics Engineers' Award, Syracuse Pulp and Paper Foundation Scholarships, and College of Forestry Foundation Scholarships.

FOREST TECHNOLOGY PROGRAM



FOREST TECHNOLOGY PROGRAM

THE WANAKENA PROGRAM

In 1912, some 1800 acres of land in the Adirondack Mountains were donated as a site for the development of a ranger school by the College. Since that time, the forest technology program has trained more than 2,500 graduates, most of whom are now working in a variety of nationwide forest activities, and has earned the School a national reputation for excellence.

The two-year curriculum trains students as forest technicians. The degree of Associate in Applied Science in Forest Technology (A.A.S.) is awarded upon the successful completion of the curriculum. The objectives of the curriculum are to provide students with (1) a knowledge of the field practices of forestry as related to forestry managerial needs, (2) the ability to work and communicate effectively with professional and paraprofessional forestry personnel, (3) an understanding of the sciences and practices of forestry with some emphasis on ecological applications.

Graduates are generally classified as forest technicians or forestry aides in initial employment positions. Forestry agencies and wood-using industries employ forest technicians as an important part of their forest management teams, usually as the "men on the ground" who plan and execute the field practice of forestry.

Since this curriculum is structured as a terminal, two-year program of the paraprofessional level, students interested in a professional degree in forestry are advised to enroll initially in one of the College four-year undergraduate programs described in Chapter VIII.

The freshman year of the forest technology curriculum consists primarily of general studies' courses which may be taken on the Syracuse Campus or at other accredited community and junior colleges and agricultural and technical institutes.

The second year of the curriculum is taken at the Ranger School on the Wanakena Campus. Presented in a varied forest environment, the curriculum's emphasis is on practical field training and on the relationships between forest technology and managerial needs. Fifty percent of the studies is devoted to field exercises, most of which are held in the School's forest. This rolling belt of managed forest, containing both hardwood and coniferous species, covers an area some 3½ miles long with widths varying from 6/10 to 2¼ miles. On two sides the forest is bounded by State Forest Preserve Lands. The forest is also adjacent to an area of several square miles of virgin timber within the Adirondack Forest Preserve. This excellent forest backdrop for the technology program provides a most diverse laboratory for instructional purposes.

Since the Ranger School is situated within a forest environment, some applicants to the forest technology program may mistakenly believe the program is one of forest lore and wilderness survival. It is, therefore, strongly emphasized that the forest technology curriculum demands high quality academic achievement. Students cannot complete the program without

concentrated and consistent study. Classes are scheduled from 8 a.m. to 12 noon six days each week, with laboratory and field exercises scheduled from 1 to 5 p.m. five days a week. The intensity of the program normally requires a minimum of seventy hours a week of evening and weekend study, daily classes, and laboratory/field exercises. Several short trips, at no additional expense to the student, are made during the year in connection with courses in logging, forest recreation, forest mensuration, and silviculture. A longer trip of eight days' duration emphasizing regional forestry practice is sponsored during the spring semester of the second year. Students must bear their proportionate share of the cost of this field trip which consists primarily of lodging and meal expenses.

LIFE AT WANAKENA

The Wanakena Campus of the College of Environmental Science and Forestry is located on the banks of the Oswegatchie River near the picturesque hamlet of Wanakena. Approximately 65 miles northeast of Watertown, New York, and 35 miles west of Tupper Lake, New York, the School's buildings and its surrounding forest border on Cranberry Lake.

The main School building consists of a central service unit with dormitory wings on either side. The central unit contains classrooms, laboratories, library, a student lounge, faculty offices, and supporting services. The wings of the main building contain additional faculty offices, the library, a kitchen, dining rooms, and 44 student rooms, each housing two students.

Faculty living quarters are nearby on the campus. Other buildings include a maintenance shop, garages, a sugar house, and storage buildings.

The close proximity of faculty offices and student quarters and the intensive field-work pattern enables students to consult easily and frequently with the faculty. The School considers this traditional close student-faculty association to be of major benefit in its training program.

Students taking the second year of the forest technology curriculum at the Wanakena Campus are required to live in the School's dormitories. An exception may be made for married students who may bring their families and rent their own private accommodations in the vicinity of the Wanakena Campus. Such accommodations are not plentiful. It is recommended that each married student arrange rental arrangements well in advance of the registration date.

The Wanakena Campus does not maintain an infirmary, nor does it have on its staff a physician or nurse. There are three physicians and a dentist available in the immediate area as well as an excellent Community Hospital in nearby Star Lake, New York. In emergency situations, the School transports the sick or injured student to the local physician of his choice or to the hospital. Further, there is no student accident or sickness insurance plan available through the Wanakena Campus, so that it is strongly suggested that the student consider such coverage for himself before he reports to the Wanakena Campus.

Because of the comparatively isolated location of the Wanakena Campus, a stock of books and supplies used in connection with the second year of the program is maintained on campus for sale to students.

During the first year of the program, College-enrolled students will be guided by the rules and regulations that govern their attendance at the Syracuse Campus. During the second year of the program, students will be guided by the general rules and regulations for all College students and an additional set of Wanakena Campus "house rules" that supplement the College's general rules and regulations.

ADMISSION

Admission Requirements

Admission requirements for entrance into the forest technology curriculum are basically the same as for the other curricula of the College of Environmental Science and Forestry. Minimum requirements are 16 Carnegie high school units as follows: English 4; history (social science) 2; science 2 (one must be chemistry or physics); mathematics 3 (including trigonometry or Math 11); and electives. Mechanical drawing and typing are strongly suggested electives.

An applicant must submit the test results of any one of the following: (1) New York State Regents Scholarship Examination, (2) College Entrance Examination Board (CEEB), Scholastic Aptitude Test (SAT), (3) American College Test (ACT).

The Director of Admissions may waive some of the above requirements under special circumstances.

In addition to the above-listed requirements, the following requirements shall be met by all applicants:

1. The applicant shall be strongly motivated toward a career as a forest technician.
2. The applicant shall be aware of and willing to accept the work requirements of this field-forestry program and its strenuous physical demands.
3. The applicant's parents (if the applicant is under 21 years of age) shall be fully aware of the field nature of the study program, its rigorous study-work regime, and supporting academic facilities.
4. A full medical examination report must be submitted.

Admission Procedures

The decision to admit any student to the Forest Technology Program rests solely with the College of Environmental Science and Forestry. Most openings in the program are filled by students who received conditional acceptances while still a senior in high school, contingent on successful completion of the first year of college. Remaining openings are filled by transfer students who have already attended college. Therefore, it is suggested that the potential Forest Technology student apply while still a high school senior. Transfer admission at a later date is still possible for those not conditionally accepted in high school.

There are two procedures:

- 1.) Seniors in high school who wish to spend the first year of the Forest Technology program on the Syracuse Campus should submit the



regular freshman application (D-1) with supplemental forms to the College, using Curriculum Code 620 (Forest Technology).

2.) Seniors in high school who wish to attend the first year of studies at another college (such as a community college), and the second year on the Wanakena Campus should: a.) Submit a regular freshman application (D-1) with supplemental forms to the College of Environmental Science and Forestry, using Curriculum Code 620 (Forest Technology). On one of the supplemental forms the student can indicate what school he plans to attend for the first year. b.) Submit a regular application to the school selected for the first year of studies.

Transfer Students

Students with previous college experience or who are currently enrolled at another college may apply for transfer. Courses transferred for credit must be appropriate to the freshman year course of studies and comparable in subject matter content and level. No transfer credit will be allowed for the second year courses taken at the Wanakena Campus. Transfer applicants must submit a recent official copy of their college transcript and a list of courses they anticipate completing prior to enrollment.

Students spending the first year of studies at some other college must complete the following courses or their equivalents before they will be permitted to enroll in the Wanakena Campus portion of the program.

English	6	sem.	hrs.	credit
General Biology (or Botany & Zoology)	6-8	"	"	"
Math (College Algebra & Trigonometry)	3-6	"	"	"
Economics	3	"	"	"
Accounting	3	"	"	"
Technical Drawing	1-2	"	"	"
Electives	3-9	"	"	"

Total 30-32



EXPENSES

Estimated costs of the second-year program on the Wanakena Campus are as follows:

	<i>Tuition</i>	<i>Board & Room</i>	<i>Books & Supplies</i>	<i>Fee</i>
New York Resident	\$ 650	Approx. \$1000	Approx. \$275	\$15
Non-Resident	\$1075	Approx. \$1000	Approx. \$275	\$15

An additional estimated expense of \$150.00 will likely be incurred to cover the cost of laundry and clothing. The cost of the 8-day regional forestry practice trip during the spring semester is estimated at approximately \$100.00. There is also a \$10.00 graduation fee and a refundable property deposit of \$15.00. Costs of the first year will vary with the specific institution attended.

FINANCIAL ASSISTANCE

Financial aid is available upon acceptance to the College of Environmental Science and Forestry. Several forms of assistance, including long-term loans, grants, work opportunities and scholarships, are offered through the Office of Financial Aid. It is necessary to submit a *Parent's Confidential Statement* to the College Scholarship Service, Princeton, New Jersey, and to file an application with the Office of Financial Aid at the Syracuse Campus. Further information can be found in the *Undergraduate Financial Aids Bulletin*.

PLACEMENT

The School assists in placement of graduates. The reputation of the Ranger School usually results in graduates being able to find employment readily. Employment is common with local, state, and Federal forestry and land resource agencies, private forestry enterprises, and surveying firms. Positions most frequently filled by recent graduates include: state forest ranger, state forest technician, forestry aide, industrial forest district supervisor, timber inventory specialist, timber sales supervisor, forest surveyor, forest engineering aide, forest protection technician, forest research technician, and forest equipment salesman.

FOREST TECHNOLOGY CURRICULUM

(Associate in Applied Science Degree)

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
(Syracuse Campus or preferably taken at a two-year college)					
***F Bot 100	General Botany . . .	4	F Zool 100	General Zoology . .	4
*Engl 101	Freshman English .	3	*Engl 102	Freshman English .	3
**Math or Elective	.....	3	**Math or Elective	.....	3
GF 100	Forest Resources and the Environ- ment	3	F Econ 290	Introduction to Eco- nomics for Forestry	3
Graph 280	Technical Drawing	1	****Elective	.....	3
Phys Ed or ROTC	.....	0	Phys Ed or ROTC	.....	0
***GF 032	Orientation	0			
		<hr/> 14			<hr/> 16

Senior Year (Wanakena Campus)

F Tech 200	Dendrology I	2	F Tech 201	Dendrology II	½
F Tech 202	Plane Surveying I . .	4	F Tech 203	Plane Surveying II . .	3
F Tech 204	Forest Mensuration & Statistics I	3	F Tech 205	Forest Mensuration & Statistics II	2½
F Tech 206	Forest Ecology	1½	F Tech 207	Aerial Photogram- metry	1½
F Tech 208	Forest Installations . .	3	F Tech 209	Forest Roads	2
F Tech 210	Silviculture I	1½	F Tech 211	Silviculture II	2
F Tech 212	General Forestry . . .	1½	F Tech 213	Forest Protection . . .	2½
F Tech 214	Personnel Management	1½	F Tech 215	Timber Harvesting . .	1½
F Tech 216	Wood Technology . .	1½	F Tech 217	Forest Management .	2
F Tech 218	Forest Recreation . . .	1	F Tech 219	Elements of Wildlife Ecology	1½
			F Tech 221	Allied Technologies .	1
			F Tech 225	Regional Forestry Practices	1½
		<hr/> 20½			<hr/> 21½

1. *If competency in freshman English is shown, these 6 credit hours can be used for electives. The selection of courses related to communication skills is strongly recommended.
2. **Competency in plane trigonometry and college algebra is required. When this is demonstrated, these become elective credits.
3. ***In addition to taking GF 032, students in this program are expected to complete the one day Orientation session, to be given at the Wanakena Campus in late May, prior to Fall Registration.
4. ****An introductory accounting elective is recommended.
5. A total of 72 credit hours is required. Upon satisfactory completion, an Associate Science (A.A.S.) degree in forest technology will be awarded.

RANGER SCHOOL COURSES (Wanakena-Campus)

Forest Technology

200. DENDROLOGY I

2 credit hours

32 hours of lecture and 42 hours of field time. A study of the distinguishing characteristics, growth features, distribution, associates, and importance of the major tree species of North America.

Seasonal field identification and on-the-spot discussion of habitats, associates, and the place in succession of the predominant forest trees and shrubs as found in the Adirondack area of the Northeast, plus a limited number of introduced species. Fall. Mr. Coufal.

201. DENDROLOGY II

1/2 credit hour

10 hours of field time. A continuation of Dendrology I, with special emphasis on identification and use as site indicators, for example ground cover plants. Spring. Mr. Coufal.

Prerequisite: F Tech 200.

202. PLANE SURVEYING I

4 credit hours

F Tech 202 and 203 together include 60 hours of lecture and 184 hours of field time. A comprehensive study of the theory and practice of plane surveying with particular stress on the development of proper field procedures and competency in the use of surveying instruments. Fall. Mr. Sterbenz.

203. PLANE SURVEYING II

3 credit hours

F Tech 202 and 203 together include 60 hours of lecture and 184 hours of field time. A comprehensive study of the theory and practice of plane surveying with particular stress on the development of proper field procedures and competency in the use of surveying instruments. Spring. Mr. Sterbenz.

Prerequisite: F Tech 202.

204. FOREST MENSURATION AND STATISTICS I

3 credit hours

32 hours of lecture and 52 hours of field time. A classroom and field study of the basic principles and skills required for timber measurements. Volume tables, their use and construction are studied. Cruise reports are required in which the student describes cruise procedures and results. Fall. Mr. Martin.

205. FOREST MENSURATION AND STATISTICS II

2 1/2 credit hours

22 hours of lecture and 44 hours of field time. A classroom, field and laboratory study of the methods utilized for collecting, analyzing, and presenting data dealing with forest measurements. In addition, the student learns to scale and grade logs and other forest products. Spring. Mr. Martin.

206. FOREST ECOLOGY

1 1/2 credit hours

28 hours of lecture and 20 hours of field time. Study of weather and weather data collection; students manning a forest weather station. Study of weather and soil factors as to how they affect trees and forests, plus the interactions within the forest community and with the environment. Attention given to the School forest soils survey with field trips to study soil and site relationships. Fall. Mr. Remele.

207. AERIAL PHOTOGRAMMETRY

1 1/2 credit hours

17 hours of lecture and 28 hours of laboratory. Development of the ability to interpret important ground features by viewing aerial photos singly and in pairs, using stereoscopic techniques and equipment. Instruction in the use of other interpretation and photo measuring equipment for making useful overlays and maps. Spring. Mr. Remele.

208. FOREST INSTALLATIONS

3 credit hours

42 hours of lecture and 60 hours of field time. This course provides the student with the technical competence necessary to use, plan, construct, and

maintain such typical forest improvements as telephone lines, radio systems, trails, small streams, and light frame structures. Fall. Mr. Miller.

209. FOREST ROADS

2 credit hours

17 hours of lecture and 44 hours of field time. This course provides the student with the technical competence necessary to administer, locate, and design the construction and maintenance of a typical forest gravel road. Spring. Mr. Miller.

210. SILVICULTURE I

1½ credit hours

F Tech 210 and 211 together include 58 hours of lecture and 24 hours of field time. Orientation regarding the place, terminology, and methods of silviculture. Coverage of the most generally used techniques for establishing and manipulating the more important forest types in the Northeast for ecological and economical satisfaction. Field demonstrations and practice in planting, thinning, pruning, timber marking, and chemical silviculture. Fall. Mr. Remele.

Prerequisite: Forest ecology.

211. SILVICULTURE II

2 credit hours

F Tech 210 and 211 together include 58 hours of lecture and 24 hours of field time. Orientation regarding the place, terminology, and methods of silviculture. Coverage of the most generally used techniques for establishing and manipulating the more important forest types in the Northeast for ecological and economical satisfaction. Field demonstrations and practice in planting, thinning, pruning, timber marking, and chemical silviculture. Spring. Mr. Remele.

Prerequisites: Forest ecology, F Tech 210.

212. GENERAL FORESTRY

1½ credit hours

27 hours of lecture. An introduction to the scope and objectives of forestry. Consideration is given to historical development, forest terminology, and forest policy. Forest agencies, both public and private, are examined. A survey of

the various kinds of forestry occupations is made with emphasis on technician level opportunities. Current events in forestry are discussed. Forest programs, education, and trends for the future are analyzed. Fall. Staff.

213. FOREST PROTECTION

2½ credit hours

44 hours of lecture and 44 hours of field time. A study of the agents damaging trees and their role in the total forest community. The basic principles of forest fire behavior, fire danger and fire danger rating, and the prevention and control of forest fires are covered. Fire simulation exercises and practice of fire suppression techniques are given.

The course covers identification of local forest insects and disease-causing organisms, study of the major pest groups of other forest regions, and control measures including the effects of pesticides in the environment. Field trips cover local pests and the damage caused while laboratory work covers major groups of pests likely to be encountered elsewhere. Spring. Mr. Coufal.

214. PERSONNEL MANAGEMENT

1½ credit hours

31 hours of lecture and 2 hours of field time. The role of personnel management within industrial companies and governmental agencies, with special consideration given the foreman level. A



study of company and agency organizational groups including selection of and placement of personnel, training of personnel and personnel performance evaluations, planning for and administering crew responsibilities, human relations in the working situation, and special personnel problems of the forest technician and professional forester are covered.

Techniques of foremanship are applied in various field exercises in other courses, along with a study of safety hazards, accident prevention, accident classification, and accident reporting. Responsibility of management, particularly the foreman, in safe working procedures is incorporated. Twelve hours of first aid training are included. Fall. Staff.

215. TIMBER HARVESTING

1½ credit hours

21 hours of lecture and 24 hours of field time. This course acquaints the student with the basic harvesting methods and techniques, with emphasis on the Northeast, along with the knowledge of how and where harvesting fits in with other forest uses. Students gain technical competence in timber sale contract administration and basic timber appraising. Spring. Mr. Miller.

216. WOOD TECHNOLOGY

1½ credit hours

17 hours of lecture and 20 hours of laboratory. Study of the development of various cell and tissue structures within trees, the gross structural features of wood, and the part these features play in the physiological processes of living trees. Physical properties of wood are studied with special emphasis given to those gross features which identify species. Attention is given to wood quality, defects of wood, and those special features which make certain species desirable for specific uses.

In the laboratory a variety of samples from the more commercially important lumber trees of North America are identified by the use of a gross feature key and 10X magnification. Fall. Staff.

217. FOREST MANAGEMENT

2 credit hours

31 hours of lecture and 16 hours of field time. The relation of silviculture to

management. Subdivisions and classification of forest properties. Determination of growing stock and growth. The forms of managed forests and methods by which forests are brought to a regulated condition. Field and lab work in preparation for a report giving recommendations for management of a portion of the School Forest. Spring. Mr. Remele.

218. FOREST RECREATION

1 credit hour

23 hours of lecture. This course acquaints the student with the forest recreational resource—its present and future needs. Principles of recreational development and management are discussed with special emphasis placed on the technical aspects. Fall. Mr. Miller.

219. ELEMENTS OF WILDLIFE ECOLOGY

1½ credit hours

19 hours of lecture and 26 hours of field time. A study of the principles of wildlife ecology with fundamentals related to the actions of the preservationist, conservationist, and particularly those of the forest manager. Spring. Mr. Martin.

Prerequisite: A course in biology or its equivalent.

221. ALLIED TECHNOLOGIES

1 credit hour

18 hours of lecture and 8 hours of laboratory. A brief introduction to four areas of modern technology that relate directly to the forest management task: aviation; radio; remote sensing; computers. Interface type information is presented so that the student is made aware that these technologies exist. Spring. Mr. Sterbenz.

225. REGIONAL FORESTRY PRACTICES

1½ credit hours

64 hours of field time. An 8-day field trip to provide concentrated and varied field observation. It is conducted during the fourth semester to give the student first-hand observation of the current forestry practices in the northeastern part of the United States. Spring. Staff.

UNDERGRADUATE PROGRAMS

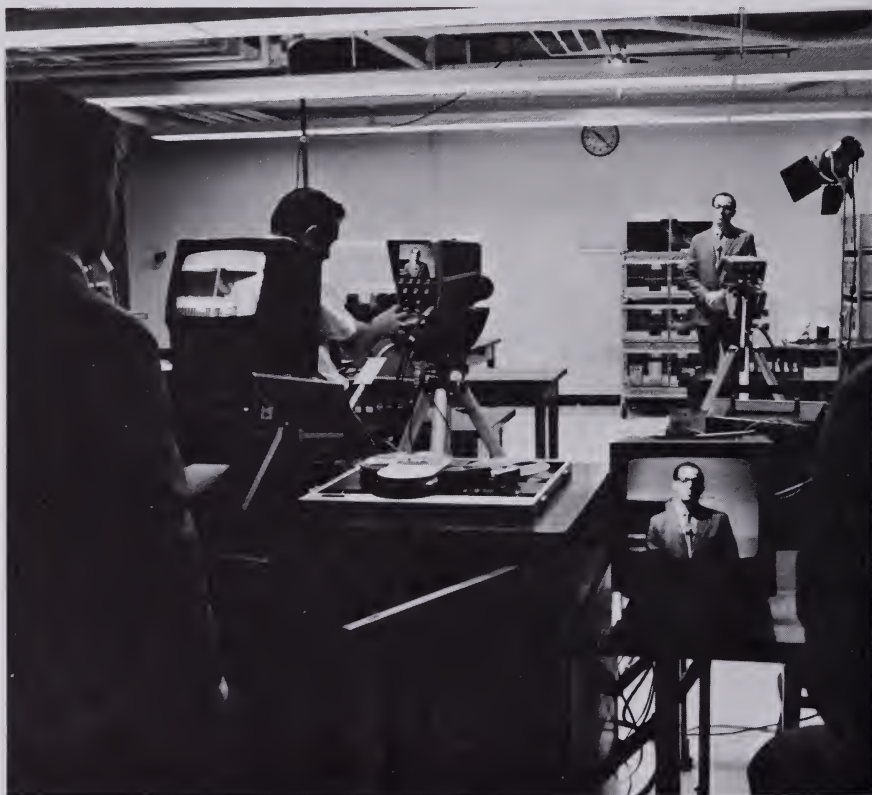


UNDERGRADUATE PROGRAMS

ENTERING FRESHMEN

The College of Environmental Science and Forestry offers professional education in seven, four-year curricula, some of which contain optional programs. The main areas of study are Forest Biology, Chemistry, Forest Engineering, Landscape Architecture, Paper Science and Engineering, Resource Management, and Wood Products Engineering. The four-year programs lead to a Bachelor of Science degree; an additional year in the Landscape Architecture program earns a Bachelor of Landscape Architecture degree.

Entering freshmen will review the demands and opportunities of the curricula with an assigned advisor during the registration period, in order to select the first-semester elective. *Before the end of the first semester, however, each freshman must make his curriculum choice.* In reaching this decision he will be assisted as needed by faculty advisors, the Office of Student Affairs, by conversations with upperclassmen, and by first-hand acquaintance with the College's programs, facilities, and personnel.



FRESHMAN YEAR — FIRST SEMESTER — ALL CURRICULA

		<i>Credit Hours</i>
F. Botany 100	General Botany	4
English	Freshman English	3
Mathematics		3
*Chemistry 106	General Chemistry	4
*Elective		3
Orientation		0
Phys. Educ. or ROTC		0
		<hr/>
		17

Students interested in meeting the education requirements for initial professional positions in Federal and state resource managing agencies are able to qualify fully by successful completion of either the Resource Management curriculum or the Forest Engineering curriculum. They may also do so in the Forest Biology curriculum through selection of appropriate forestry courses as electives, under guidance of a faculty advisor.

TRANSFER STUDENTS

The College of Environmental Science and Forestry has designed its undergraduate curricula to accommodate entering transfers from two-year and other colleges. Students taking recommended course series or Associate degree programs containing specified courses generally may register at the entering junior level without credit loss. The various course or program requirements for effective transfer are listed in each curriculum description in the following section. A transfer student will be held responsible for the total credit hour requirement of the curriculum into which he enrolls, including special summer sessions, field trips and/or summer employment as required in that major.

The Admissions Office will be pleased to answer questions concerning transferring, and to evaluate records and advise on courses where there are questions. Students applying for transfer will generally follow the admissions procedures described on page 30.

DUAL ENROLLMENT WITH TWO-YEAR COLLEGES

The College of Environmental Science and Forestry has completed an arrangement for a dual enrollment program with the Columbia-Greene Community College for those students who wish to transfer to the College. Any applicant for the Liberal Arts, Math and Science program with a Forest

*Students who definitely know they are going to pursue the Environmental Studies and Landscape Architecture Curricula will substitute Philosophy 105, 3 credit hours, for Chemistry, 4 credit hours, and will take Graphics 182: Art Media I, 1 credit hour, as their elective, for a total semester load of 14 credit hours.

Management concentration at the two-year college is evaluated by both institutions. Upon acceptance and successful completion of the Associate in Science degree, the student is automatically accepted to the College of Environmental Science and Forestry.



THE SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

The School of Biology, Chemistry and Ecology offers two curricula supporting the science and ecological areas of environmental science and forestry.

Forest Biology

The Forest Biology Curriculum is designed to educate biologists, and to provide them an orientation to forestry principles. This program was developed for those students planning graduate study in the biological sciences as well as those seeking positions as forest biologists in forestry, such as forestry research, disease and insect control, recreation, fish and wildlife biology, or conservation. The effective management and protection of forests and related natural resources are becoming increasingly dependent on the research contributions and professional guidance of biologists for solutions of a wide range of natural resource problems.

The curriculum is built around a core of required courses which provides a sound background in biology and the physical sciences, an introduction to forestry principles, and a general education. It is designed to achieve breadth in biology as well as depth in a selected concentration area. The Forest Biology Curriculum is flexible and a variety of programs may be developed within or across the various participating departments to meet the academic goals and special subject interests of the student. Each student is assigned an advisor to aid in program decisions. All students are considered to be majoring in *biology*.

General requirements for Federal and state biology positions are met. Position requirements in a broad range of special biological fields related to natural resources also may be achieved by selection of electives. Requirements for Federal and state forestry positions may be satisfied by choosing specified forestry subjects as electives.

The curriculum has been arranged to facilitate transfer of students from the State University community colleges at the end of their freshman or sophomore years. Recommended core courses for students planning to transfer as entering juniors total 64 credits or an Associate degree and include:

Biology	8 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
Physics	8 credits
Mathematics through Integral Calculus	8 credits
Economics	3 credits
English	6 credits
*Electives	14 credits

Attendance at a 5-week Summer Session course in Field Forestry at the Pack Demonstration Forest, Warrensburg, New York, is required. In special

*To include 3 courses totaling 9 credits in the humanities and social sciences.

cases, attendance at the Cranberry Lake Biological Station or its equivalent may be substituted (see note 3 under electives).

In addition to the courses specified in the program, students must meet the following requirements:

- 1) Twelve credits in a selected biology concentration (zoology or wild-life biology, botany, forest entomology, silvics).
- 2) Six credits in a second biological area.
- 3) The courses selected in the concentration subjects should include at least one from each of three of the following broad areas of biology: physiology, classification, structure-development, and ecology.
- 4) Three credits in the resources management area.
- 5) Nine credits in the humanities and social sciences selected with the approval of the faculty advisor.
- 6) Twenty-seven credits in elective courses selected with the approval of the faculty advisor.

Electives

1. Students planning graduate study are urged to take two semesters of a language (as approved by their faculty advisor) as a part of their humanistic-social sciences elective requirement.
2. Students planning to meet special requirements for biology specialty positions in Federal and state service should review the available Civil Service publications and become familiar with the specific course requirements to be met by elective choice.
3. Students planning to meet special requirements for Federal Civil Service positions in forestry at the GS-5 and GS-7 levels may do so by electing 10 credits in additional forestry courses and attending the Summer Session in Field Forestry at Warrensburg, New York. These special forestry requirements may be fulfilled by courses selected with the approval of the faculty advisor.

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1. *Mathematics through integral calculus (Math 227 or the equivalent) is required.
 2. **Students with a 2.5 academic average or better may substitute for this requirement 8 credit hours of courses at the Cranberry Lake Biological Station or a minimum of 6 credit hours at other biological field stations. The courses selected must have the approval of the student's advisor. A minimum of 6 credit hours is required, and it is preferable that the summer program be taken between the junior and senior years.
 3. Five credits of additional forestry courses are recommended for those students not attending the Summer Session in Field Forestry.
 4. A total of 131 credit hours is required in this curriculum.

FOREST BIOLOGY CURRICULUM

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
Chem 106	General Chemistry ..	3	Chem 116	General Chemistry ..	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Engl 101	Freshman English ..	3	Engl 102	Freshman English ..	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		<hr/> 17			<hr/> 17
Sophomore Year					
F Chem 221	Organic Chemistry I .	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry Lab I	1	F Chem 224	Organic Chemistry Lab II	1
Phys 103	General Physics	4	Phys 104	General Physics	4
F Biol 320	General Ecology	3	F Econ 300	Intro to Macro Economics	3
Electives		6	Electives		6
		<hr/> 17			<hr/> 17
Summer Session Alternate A**					
SUMMER SESSION IN FIELD FORESTRY. 5 weeks—6 credit hours. This program is conducted in two separate sessions during the summer period at the College's Pack Demonstration Forest near Warrensburg, New York.			F Biol 301	Field Biology	1
			Silvi 302	Silvics	1
			F Mgt 303	Introduction to Forest Measurements	1
			Res Mgt 304	Silviculture—Resources Management	3
					<hr/> 6
**See Note 2 page 52.					

**See Note 2 page 52.

Junior Year					
F Bot 210	Dendrology I	2	AM 571	Introduction to	} 3
F Ento 500	Elements of Forest		or	Statistical	
	Entomology	3		Analysis(3)	
F Biol 330	Principles of General		AM 591	Introduction to	} 3
	Physiology	3		Probability and	
Electives		6		Statistics(3)	
		—	Geol 101	General Geology (3)	} 3
			or		
			Silvi 332	Soils(3)	
			Electives		6
		14			12

Summer Session Alternate B**

SUMMER SESSION IN ENVIRONMENTAL BIOLOGY
 8 weeks, 8 credits. Courses selected require approval of the student's advisor. Program conducted in June-August at the Cranberry Lake Biological Station, Pack Experimental Forest, Cranberry Lake.

Summer Session Alternate C**

Attendance at other approved biological field stations may be arranged. The courses selected must have the prior approval of the student's advisor.

Senior Year			
F Biol 571	Fundamentals of Genetics	3	Electives 15
F Biol 572	Fundamentals of Genetics Lab	1	—
Electives		12	
		16	15

Chemistry

By selecting proper electives, students in either of the two following options may be certified on graduation as having completed an American Chemical Society approved curriculum. Both options are excellent grounding for professional work at the B.S. level or for advanced graduate study.

Because of cooperative arrangements among local institutions, students may also emphasize various aspects of Environmental Chemistry.

Recommended core courses for students planning to transfer as entering juniors total 64 credits or an Associate degree and include:

Biology	8 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
Physics	8 credits
Mathematics through Integral Calculus	8 credits
Economics	3 credits
English	6 credits
Electives	14 credits

Biochemistry and Natural Products Option

This option is designed for students who wish to approach problems in the life sciences with the tools and point of view of the chemist. In addition to a major concentration in the several branches of chemistry, the student obtains a solid grounding in the fundamentals of physics, mathematics, and biology. Professional electives can provide a minor concentration in botany, ecology, entomology, zoology, or physiology. Collaborative efforts of chemists and biologists are providing new solutions to problems of environment, natural resources, and health.

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1. *One course of mathematics or applied mathematics beyond Math 227 or Math 397, or equivalent, is required.
 2. **A sequence of professional electives should be chosen in the junior year. In addition to the freshman biology courses, a student whose emphasis is in biochemistry must take 3 semester hours of genetics and at least another 3 semester hour biology course. A student whose emphasis is in natural products must take 3 semester hours of biology in addition to the freshman biology courses and an additional hour of organic chemistry laboratory (F Chem 496) and a second hour of F Chem 584.
 3. ***Polymer Properties, F Chem 556 (3 credit hours) is suggested.
 4. ****Petition by the student to the Department for replacement of this requirement will be considered to allow time for special interest.
 5. *****GF 502 may be substituted.
 6. A total of 133 credit hours is required.

FOREST CHEMISTRY CURRICULUM

BIOCHEMISTRY AND NATURAL PRODUCTS CHEMISTRY OPTION

First Semester	Credit Hours	Second Semester	Credit Hours
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Freshman Year

F Bot 100	General Botany ...	4	F Zool 100	General Zoology .	4
Chem 106	General Chemistry .	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		<hr/> 17			<hr/> 17

Sophomore Year

F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry	
F Chem 222	Organic Chemistry			II	3
	Lab I	1	F Chem 224	Organic Chemistry	
Engl 210	Advanced			Lab II	1
	Composition and		Engl 211	Technical Writing	3
	Literature	3	*Math or Elective		3
*Math or Elective		3	Phys 212	General Physics	
Phys 211	General Physics for			for Science	
	Science Students I	4		Students II	4
Elective		3	F Econ 290	Introduction to	
		<hr/>		Economics for	
				Forestry	3
		<hr/> 17			<hr/> 17

Junior Year

F Chem 325	Organic Chemistry		*Math or Elective	3
	III	4	F Chem 584 Spectrometric	
Chem 332	Quantitative		Identification of	
	Analysis	2	Organic	
Chem 333	Quantitative		Compounds . . .	1
	Analysis Lab . . .	1	Chem 434 Instrumental	
Chem 346	Physical Chemistry.	3	Analysis	2
**Professional Elective	2-4		Chem 435 Instrumental	
Elective	3		Analysis Lab . .	1
			Chem 356 Physical Chemistry	3
			Chem 357 Physical Chemistry	
			Lab	1
			**Professional Elective	2-3
			Elective	3
		<hr/>		<hr/>
		15-17		16-17

Senior Year

F Chem 495	Introduction to		****F Chem 498	Introduction to	
	Professional			Research	5
	Chemistry	2	F Chem 497	Undergraduate	
F Chem 575	Wood Chemistry I .	2		Seminar	1
F Chem 578	Wood Chemistry		F Chem 532	Biochemistry II .	3
	Lab	1	F Chem 577	Wood Chemistry	
F Chem 530	Biochemistry I	3		III	2
F Chem 531	Biochemistry Lab ..	2	*****Pub Add 215	Public Speaking.	3
***Electives		6	Elective		3
		<hr/> 16			<hr/> 17



Natural and Synthetic Polymer Chemistry Option

This option is designed for students interested in the structure and physical properties of man-made and natural materials, the giant molecules of wood, plastics, polysaccharides, proteins, rubbers, and fibers. The recently discovered chemistry of these materials constitutes one-half the concern of chemical industry and is the origin of a major revolution in our way of life and our understanding of nature. This special subject area is an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum.

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1. *One course of mathematics or applied mathematics beyond Math 227 or Math 397, or equivalent, is required.
 2. **A sequence of two or more professional electives in related disciplines with a minimum of 5 credits should be chosen in the fall of the junior year from the College offerings. Wood Products Engineering and Paper Science and Engineering courses are recommended.
 3. ***F Chem 530: Biochemistry I (3 credit hours) suggested.
 4. ****Petition by student to the Department for replacement of this requirement will be considered to allow time for special interest.
 5. *****GF 502 may be substituted.
 6. A total of 133 credit hours is required.

FOREST CHEMISTRY CURRICULUM

NATURAL AND SYNTHETIC POLYMER CHEMISTRY OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany ...	4	F Zool 100	General Zoology .	4
Chem 106	General Chemistry .	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		<hr/> 17			<hr/> 17

Sophomore Year

F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry	
F Chem 222	Organic Chemistry			II	3
	Lab I	1	F Chem 224	Organic Chemistry	
Engl 210	Advanced Composi-			Lab II	1
	tion and Literature	3	Engl 211	Technical Writing	3
*Math or Elective		3	*Math or Elective		3
Phys 211	General Physics for		Phys 212	General Physics for	
	Science Students I	4		Science Students	
Elective		3		II	4
		<hr/> 17	F Econ 290	Introduction to	
				Economics for	
				Forestry	3
		<hr/> 17			<hr/> 17

Junior Year

F Chem 325	Organic Chemistry		*Math or Elective		3
	III	4	F Chem 584	Spectrometric	
Chem 332	Quantitative			Identification of	
	Analysis	2		Organic	
Chem 333	Quantitative Analysis			Compounds ...	1
	Lab	1	Chem 434	Instrumental	
Chem 346	Physical Chemistry	3		Analysis	2
**Professional Elective		2-4	Chem 435	Instrumental	
Elective		3		Analysis Lab ..	1
		<hr/> 15-17	Chem 356	Physical Chemistry	3
			Chem 357	Physical Chemistry	
				Lab	1
			**Professional Elective		2-3
			Elective		3
		<hr/> 15-17			<hr/> 16-17

Senior Year

F Chem 495	Introduction to		****F Chem 498	Introduction to	
	Professional			Research	5
	Chemistry	2	F Chem 552	Introduction to	
F Chem 550	Introduction to			Polymer	
	Polymer			Chemistry II .	3
	Chemistry I	3	F Chem 577	Wood Chemistry	
F Chem 551	Polymer Techniques	2		III	2
F Chem 575	Wood Chemistry I .	2	F Chem 497	Undergraduate	
F Chem 578	Wood Chemistry			Seminar	1
	Lab	1	*****Pub Add 215	Public Speaking.	3
***Electives		6	Elective		3
		<hr/> 16			<hr/> 17

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

The School of Environmental and Resource Engineering applies the principles and professional skills of engineering analysis and design to creative environmental stewardship, with emphasis on responsible use of renewable natural resources for the benefit of society. The curricula, programs and activities of the School are oriented toward multiple use of forest resources, wood products, paper and related fibrous materials. Environmental considerations, including pollution abatement, waste recovery and recycle, energy conservation, noise control and safety optimization, are basic to all courses and studies.

In each curriculum, fundamental professional requirements are met by a core of required courses, supplemented by optional choices and electives. Students may enter either as freshmen or as transfers from other colleges or universities. Applicants with Associate degrees in engineering science or science and mathematics usually enter as juniors. Graduates of two-year technology programs may also earn junior standing if their previous studies include one year each of English, general chemistry and general physics, plus mathematics through integral calculus. Courses in general botany, engineering mechanics and economics are also desirable.

The School offers B.S. degrees in Forest Engineering, Paper Science and Engineering and Wood Products Engineering. Specific requirements in the programs leading to these degrees are described below.

Forest Engineering

The primary objective of this curriculum is to prepare qualified graduates who will operate with professional engineering competence within the context of forestry and natural resources development. It is an engineering curriculum, fundamentally interwoven with essential principles of forestry to develop environmental understanding and ecological awareness.

Students who successfully complete this four-year curriculum will be awarded a Bachelor of Science degree by the College. This degree is a starting point for a wide range of career opportunities, since minimum pro-

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1. Twelve credit hours must be elected in social sciences or humanities, at least 3 of which must be from the College.
 2. *Mathematics through differential equations is required.
 3. **Electrical Engineering, thermodynamics, or advanced engineering materials, each beyond freshman physics or the equivalent of CIE 325.
 4. ***An advisor approved engineering design or synthesis course may be substituted. To be approved, the course must fit the objectives of professional forest engineering. Advanced courses in production or operational systems are suitable examples.
 5. ****An advisor approved photogrammetry course may be substituted for F Engr 503.
 6. A total of 136 credit hours is required for the B.S. degree from the College in this curriculum.

FOREST ENGINEERING CURRICULUM

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Zool 100	General Zoology . .	4
Chem 106	General Chemistry .	3	Chem 116	General Chemistry .	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
*Engl 101	Freshman English . .	3	Engl 102	Freshman English .	3
*Math or Elective		3	*Math or Elective		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		17			17

Sophomore Year

*Math or Elective		3	*Math or Elective		3
Graph 280	Technical Drawing . .	1	AM 360	Introduction to	
F Econ 301	Introduction to			Computer	
	Micro-Economics .	3		Programming . .	3
Phys 103	General Physics . . .	4	F Econ 300	Introduction to	
MEE 225	Engineering			Macro-Economics	3
	Mechanics	4	Phys 104	General Physics . .	4
Elective		3	MEE 226	Engineering	
				Mechanics	3
		18			16

Junior Year

F Engr 310	Forest Engineering		F Engr 301	Plane and Geodetic	
	Problems	3		Surveying	3
F Bot 210	Dendrology I	2	F Engr 340	Hydrology	3
AM 591	Introduction to		F Engr 563	Photogrammetry . .	3
	Probability and		Silvi 324	General Silviculture	3
	Statistics	3	CIE 325	Mechanics of	
Math 585	Higher Mathematics			Deformable	
	for Engineers and			Bodies	3
	Scientists I	3	Elective		3
CIE 327	Principles of Fluid				
	Mechanics	4			
**Engineering Science Elective		3			
		18			18

Senior Year

F Engr 410	Structures	4	F Engr 510	Transportation	
F Engr 412	Principles of Production (Harvesting) .	3		Systems	3
F Mgt 530	Forest Management .	4	***F Engr 540	Hydrologic Controls	3
CIE 437	Soil Mechanics and		F Engr 599	Forest Engineering	
	Foundations I	3		Planning	4
Elective		2-3	Electives		6
		16-17			16

Optional Senior Year—Photogrammetry & Geodetic Engineering Emphasis

F Engr 502	Terrestrial Geodesy .	3	F Engr 566	Remote Sensor	
F Engr 560	Theory of Errors and			Interpretation . .	3
	Adjustments	3	F Engr 599	Forest Engineering	
F Engr 564	Photogrammetry II .	3		Planning	4
AM 560	Information Processing Fundamentals	3	****F Engr 503	Astro-Geodesy . . .	3
F Mgt 530	Forest Management .	4	Electives		6
		16			16

fessional requirements, both in Engineering and in Forestry, are met by the core of required courses. This core may then be supplemented in areas suited to the students' goals through proper advisory use of the many electives within the curriculum.

Qualified graduates in search of further formal education will find easy access to engineering graduate schools throughout the country as well as a number of graduate programs here at the College and Syracuse University. In addition, graduates may enter an established five-year program in either civil, industrial or mechanical engineering at Syracuse University. A Bachelor of Science degree in Engineering will be awarded by Syracuse University upon completion of requirements in the fifth year.

Graduates with Associate degrees in engineering science or science and mathematics usually find transfer acceptance as entering juniors. Students looking forward to career opportunities in Forest Engineering are urged to obtain guidance on specific requirements from the Admissions Office of the College as early as possible in their preparatory programs.



Paper Science and Engineering

The curricula in the Department of Paper Science and Engineering are designed to provide a broad base of study and to prepare students for a variety of careers in the paper and related industries. Two options are offered: Paper Science and Paper Engineering.

Paper Science Option

This program provides basic training in the physical sciences, mathematics, and engineering, combined with a specific understanding of the chemistry and anatomy of wood, pulping of wood, chemistry and physics of paper and paper formation, and the chemical engineering of pulp and paper processing. The option permits the student a range of elective courses with a choice between the sciences or management.

PAPER SCIENCE & ENGINEERING CURRICULUM

PAPER SCIENCE OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry	3
Engl 101	Freshman English	3	Chem 117	General Chemistry Lab	1
*Math		3	Engl 102	Freshman English	3
Elective		3	*Math		3
Phys Ed or ROTC		0	Elective		3
GF 032	Orientation	0	Phys Ed or ROTC		0
		17			16

Sophomore Year					
*Math or Elective		3	*Math or Elective		3
F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry		F Chem 224	Organic Chemistry	
	Lab I	1		Lab II	1
Phys 103	General Physics	4	Engl 211	Technical Writing	3
Acct 204	Financial Accounting		Phys 104	General Physics	4
	Systems	3	Elective		3
F Econ 301	Introduction to Micro-				
	Economics	3			
		17			17

Junior Year					
F Chem 575	Wood Chemistry I	2	Graph 181	Graphics I	2
F Chem 576	Wood Chemistry II	2	Chem 332	Quantitative Analysis	2
Chem 346	Physical Chemistry	3	Chem 333	Quantitative Analysis	
PSE 300	Introduction to the			Lab	1
	Pulp & Paper		Chem 356	Physical Chemistry	3
	Industry	3	Chem 357	Physical Chemistry Lab	1
WPE 487	Wood Structure &		PSE 301	Pulp and Paper	
	Properties	4		Processes	3
Elective		3	PSE 302	Paper Processes Lab	1
			PSE 570	Principles of Mass and	
				Energy Balance	3
		17			16

SUMMER MILL EXPERIENCE: PSE 304—Mill Experience—5 credit hours. Twelve weeks' full-time pulp or paper mill employment approved by the Department between the junior and senior years.

Senior Year					
PSE 561	Pulping Technology	4	PSE 496	Special Topics	1
PSE 565	Paper Properties	5	PSE 556	Economics of Pulp &	
PSE 572	Pulp & Paper Unit			Paper	3
	Operations Lab I	1	PSE 566	Paper Coating	3
PSE 575	Unit Operations I: Fluid		PSE 568	Papermaking Processes	3
	Mechanics & Heat		PSE 578	Unit Operations III:	
	Transfer	3		Mass Transfer	3
PSE 576	Unit Operations II:		PSE 579	Unit Operations IV:	
	Process Control and			Recovery Processes	
	Mass Transfer	2		Operations	2
		15			15

- *Mathematics through Math 227 or the equivalent is required; it is recommended that students in this option also complete Math 328.
- A total of 135 credit hours is required in this option.



Paper Engineering Option

A student may earn a chemical engineering degree in one year following the completion of this option. This program is designed to provide a basic education in the physical sciences and mathematics, with emphasis on chemical engineering. Courses include fundamental studies in wood chemistry, wood anatomy, pulping, and the chemistry and physics of paper and paper formation.

Students having an Associate Degree in Engineering Science can complete their Baccalaureate Degree program in two years. Students who do not have an Associate Degree in Engineering Science may also enter and obtain a Baccalaureate Degree in two years provided they have acceptable transfer credits of 66 credits. These credits shall include the following core courses:

English	6 credits
General Chemistry	8 credits
Organic Chemistry	8 credits
General Physics	8 credits
*Mathematics	9 credits
Economics	6 credits
Electives	As required

If a student desires to take more than two years to complete his Bachelor of Science Degree program, deficiencies in the core courses may be completed during the regular academic year. Credit hours for core courses taken in addition to the Associate Degree cannot be substituted for credit hours in either the junior or senior year. If a student has taken a course during the first two years that is considered equivalent to any of the required courses in the final two-year program at the College of Environmental Science and Forestry, substitution of other appropriate courses can be made, but the total credit hours required for graduation will not be reduced.

*Paper Science Option students need analytical geometry, differential and integral calculus; Paper Engineering Option students need 3 additional credits in an advanced mathematics course beyond integral calculus.

PAPER SCIENCE & ENGINEERING CURRICULUM

PAPER ENGINEERING OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry	3
Engl 101	Freshman English	3	Chem 117	General Chemistry Lab	1
*Math		3	Engl 102	Freshman English	3
Elective		3	*Math		3
Phys Ed or ROTC		0	Elective		3
GF 032	Orientation	0	Phys Ed or ROTC		0
		17			16

Sophomore Year					
Math or Elective		3	*Math or Elective		3
F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry		F Chem 224	Organic Chemistry	
	Lab I	1		Lab II	1
Phys 103	General Physics	4	Phys 104	General Physics	4
Acct 204	Financial Accounting		Engl 211	Technical Writing	3
	Systems	3	Elective		3
F Econ 301	Introduction to Micro-				
	Economics	3			
		17			17

Junior Year					
F Chem 575	Wood Chemistry I	2	Graph 181	Graphics I	2
F Chem 576	Wood Chemistry II	2	Chem 332	Quantitative Analysis	2
Chem 346	Physical Chemistry	3	Chem 333	Quantitative Analysis	
PSE 300	Introduction to the Pulp			Lab	1
	and Paper Industry	3	Chem 356	Physical Chemistry	3
WPE 487	Wood Structure &		Chem 357	Physical Chemistry Lab	1
	Properties	4	PSE 301	Pulp and Paper	
Elective		3		Processes	3
			PSE 302	Paper Processes Lab	1
			PSE 570	Principles of Mass and	
				Energy Balance	3
		17			16

SUMMER MILL EXPERIENCE: PSE 304—Mill Experience—5 credit hours. Twelve weeks' full-time pulp or paper mill employment approved by the Department between the junior and senior years.

Senior Year					
PSE 561	Pulping Technology	4	PSE 496	Special Topics	1
PSE 565	Paper Properties	5	PSE 566	Paper Coating	3
PSE 572	Pulp & Paper Unit		PSE 568	Papermaking Processes	3
	Operations Lab I	1	PSE 574	Pulp & Paper Unit	
PSE 575	Unit Operations I:			Operations Lab II	3
	Fluid Mechanics &		PSE 578	Unit Operations III:	
	Heat Transfer	3		Mass Transfer	3
PSE 576	Unit Operations II:		PSE 579	Unit Operations IV:	
	Process Control and			Recovery Processes	
	Mass Transfer	2		Operations	2
		15			15

- *Mathematics through Math 328, or the equivalent is required; it is recommended that students in this option also complete Math 585.
- A total of 135 credit hours is required in this option.

Wood Products Engineering

The mission of the Department of Wood Products Engineering is to prepare students for a wide variety of professional occupations all of which are concerned with the use of wood as a primary structural material. Four options are available in the department's curriculum: Building Construction, Materials Marketing, Production Systems Engineering, and Wood Science. Brief descriptions of these options are shown in the following sections.

Because wood is the only major construction material that comes from a renewable natural resource, attention is being focused on it as a substitute for other classes of materials which originate from, and therefore deplete, nonrenewable resources. Thus, one of the aims of the departmental program is to teach students the fundamentals of efficient wood processing, distribution or final use, whether that be a piece of furniture or a complete house.

Students may enter this curriculum either as freshmen or as transfers from other colleges or universities. Students with Associate degrees may enter with full junior standing if certain subject matter requirements are met. These requirements are different for the various options and are specified in detail under the option descriptions below. Students considering transfer into the Wood Products Engineering Department are urged to consult with College Admissions personnel for detailed guidance concerning option requirements.

Wood Science Option

The basic mission of the Wood Science option is to give students a sufficiently basic and broad scientific background so that they will be prepared to enter graduate school for advanced degrees and ultimately go into positions in research and/or development work in industry, government laboratories, or universities.

The Wood Science option has two major subdivisions: 1) The biological aspects of Wood Science in which the relationships between the pure biological sciences and the anatomy-property relationships of wood are brought out, 2) The physical science aspects of Wood Science in which the basic physical sciences are used to help characterize the structure-property relationships in wood. Students may further broaden their background in either of these programs through the wise use of electives.

Transfer students with an A.A.S. or A.S. degree may enter with full junior standing if their previous course work includes one year each of general chemistry, organic chemistry, and physics, plus mathematics through topics in calculus. Any deficiencies in botany or zoology may be fulfilled later.

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1. *It is recommended that at least 9 credit hours of these electives be in the social sciences or humanities.
 2. A total of 133 credit hours is required in this option.

WOOD PRODUCTS ENGINEERING CURRICULUM

WOOD SCIENCE OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Chem 106	General Chemistry	3	Chem 116	General Chemistry	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
Engl 101	Freshman English	3	Engl 102	Freshman English	3
Math 125	Elementary Analytic Geometry	3	Math 226	Differential Calculus	3
			Graph 181	Graphics I	2
Elective		3	Phys Ed or ROTC		0
Phys Ed or ROTC		3			
GF 032	Orientation	0			
		<hr/> 17			<hr/> 16

Sophomore Year					
F Chem 221	Organic Chemistry I	3	F Chem 223	Organic Chemistry II	3
F Chem 222	Organic Chemistry Lab I	1	F Chem 224	Organic Chemistry Lab II	1
Engl 210	Advanced Composition and Literature	3	Engl 211	Technical Writing	3
Math 227	Integral Calculus	3	Math 328	Topics in Calculus	3
Phys 103	General Physics	4	Phys 104	General Physics	4
*Elective		3	F Econ 290	Introduction to Economics for Forestry	3
		<hr/> 17			<hr/> 17

Junior Year					
Chem 346	Physical Chemistry	3	Chem 356	Physical Chemistry	3
WPE 322	Mechanical Processing	3	WPE 526	Fluid Treatments	3
F Bot 210	Dendrology I	2	WPE 520	Polymeric Adhesives and Coatings	3
AM 591	Introduction to Probability and Statistics	3	*Electives		6
Wood Anatomy Sub-option:					
F Biol 330	Principles of General Physiology	3			
or					
Wood Physics Sub-option:					
AM 360	Introduction to Computer Programming	4			
WPE 487	Wood Structure & Properties	4			
		<hr/> 18			<hr/> 15

WPE: 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

Senior Year					
WPE 522	Composite Materials	3	WPE 502	Timber Mechanics	4
Wood Anatomy Sub-option:			WPE 498	Research or Design Problem	3
WPE 585	Microtechnique and Photomicrography	(3)	Wood Anatomy Sub-option:		
Phys 261	Introduction to Modern Physics	(3)	WPE 588	Commercial Timbers of the World	(3)
Wood Physics Sub-option:			F Bot 585	Plant Anatomy	(3)
MEE 225	Engineering Mechanics	(4)	Wood Physics Sub-option:		
F Chem 556	Polymer Properties	(3)	MEE 226	Engineering Mechanics	(3)
WPE 566	Wood-Water Relationships	3	F Chem 520	Nuclear Chemical Techniques	(3)
*Electives		2-3	*Elective		3
		<hr/> 15			<hr/> 16

Building Construction Option

The current pressures for new housing and urban reconstruction have led to an option that develops a deep awareness of the effects of construction on the environment, as well as the efficient use of materials, particularly wood. There is an increasing demand for technically trained specialists in the construction industry and supporting fields who have the skills to use efficiently the wide variety of wood-based building materials, with consideration to their place in respect to other materials and to the purpose of the end product.

The specialty electives are designed to allow the opportunity for concentration areas related to the individual's career objectives. It is felt that the wide range of construction activities found in practice cannot be adequately serviced by a rigid program of study.

Suggested areas and available courses have been grouped below. Many courses are not mentioned, but most relevant material should be under the following areas:

<i>Engineering</i>	<i>Management</i>	<i>Environment</i>
Structural Analysis	Marketing	Urban Planning
Building Systems	Business Law	Solid Waste Disposal
Adv. Soil Mechanics	Accounting	Waste Water Treatment
Photogrammetry	Finance	Environmental Sanitation
Thermodynamics	Industrial Management	Land Use
Transportation	Operations Research	Landscape Architecture
Systems Analysis	Real Estate	General Ecology

Transfers with A.A.S. or A.S. degrees will be accepted with full junior standing. They are required to have at least one semester each of chemistry and physics and recommended to have calculus and engineering mechanics. Calculus and engineering mechanics may be taken after transfer with some sacrifice of elective courses and the possibility of delayed graduation.

With careful planning and use of electives, students can obtain a B.S. degree in Civil or Mechanical Engineering at Syracuse University with an additional year's work.



WOOD PRODUCTS ENGINEERING CURRICULUM BUILDING CONSTRUCTION OPTION

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-Economics	3
Chem 106	General Chemistry . .	3	Chem 116	General Chemistry . .	3
Chem 107	General Chemistry Lab	1	Chem 117	General Chemistry Lab	1
Engl 101	Freshman English . . .	3	Engl 102	Freshman English . .	3
Math 125	Elementary Analytic Geometry	3	Math 226	Differential Calculus .	3
*Elective		3	Graph 181	Graphics I	2
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		<hr/> 17			<hr/> 15

Sophomore Year

MEE 225	Engineering Mechanics	4	F Engr 301	Plane and Geodetic Surveying	3
F Econ 301	Introduction to Micro-Economics	3	**Specialty Elective		3
Math 227	Integral Calculus . . .	3	Phys 104	General Physics . . .	4
Phys 103	General Physics	4	Geol 101	General Geology . . .	3
*Elective		3	*Elective		3
		<hr/> 17			<hr/> 16

Junior Year

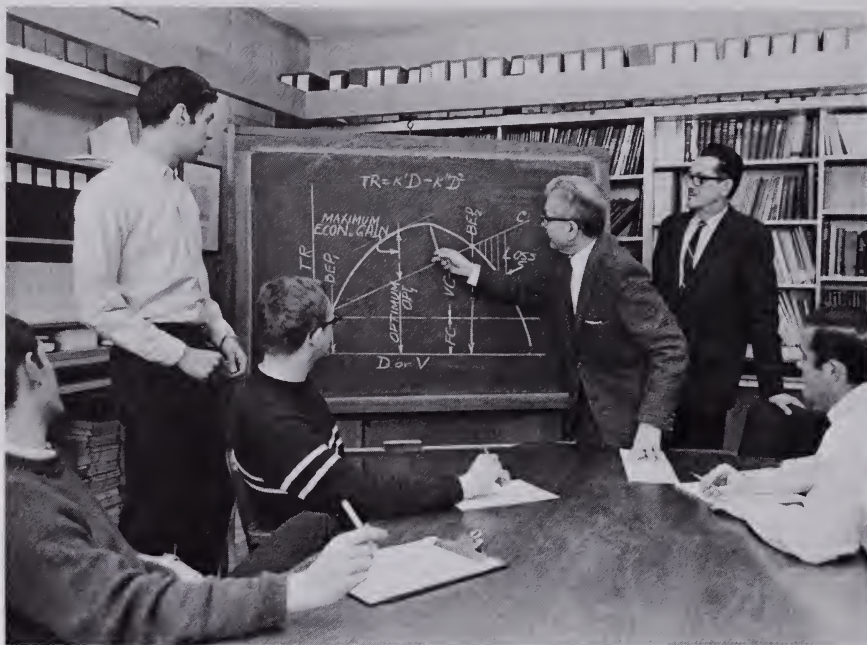
WPE 322	Mechanical Processing	3	WPE 502	Timber Mechanics . .	4
WPE 487	Wood Structure and Properties	4	WPE 520	Polymeric Adhesives & Coatings	3
AM 360	Introduction to Computer Programming	3	F Engr 342	Hydraulics in Construction	4
Acct 204	Financial Accounting Systems	3	CIE 326	Engineering Materials	3
**Specialty Elective		3	*Elective		3
		<hr/> 16			<hr/> 17

WPE: 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

Senior Year

WPE 522	Composite Materials . .	3	WPE 544	Materials Marketing .	3
F Engr 410	Structures	4	WPE 550	Construction Equipment	3
F Engr 531	Soil Mechanics for Engineers	3	WPE 554	Construction Management	3
Specialty Elective		3	*Elective		3
*Elective		3	**Specialty Elective		3
		<hr/> 16			<hr/> 15

- *It is recommended that students elect at least 12 credit hours from the social sciences or the humanities.
- **Refer to option description for listings of possible areas.
- A total of 131 credit hours is required in this option.



Production Systems Engineering Option

The goal of this option is to provide an engineering background in the fields of process development, plant design, and production management of modern industries utilizing wood and related materials. Modern production plants are complex systems of machines, men, money and management integrated for production in highly competitive markets. Because the design and operation of such systems are essentially an engineering problem, this option provides a solid foundation in fundamental sciences and applied mathematics which are the basic tools needed. Beyond the basics, students take courses in engineering and management sciences essential to the planning and development of production processes and to the design and operation of modern manufacturing facilities.

Transfer students with A.A.S. or A.S. degrees may enter with full junior standing if their previous course work includes one year each of chemistry and physics plus mathematics through integral calculus. Students who have questions concerning their status after transfer into this option should consult Admissions Office personnel.

Production Systems Engineering students may arrange with their advisors to prepare for special program options leading to admission into a Bachelor of Science Degree program at Syracuse University in either Industrial or Mechanical Engineering. Seniors presenting acceptable Graduate Record Examination scores may be admitted to an M.S. program in Industrial Engineering at Syracuse University. With adequate planning such degrees can usually be obtained after one year's additional work.

WOOD PRODUCTS ENGINEERING CURRICULUM PRODUCTION SYSTEMS ENGINEERING OPTION

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Econ 300	Introduction to Macro-	
Chem 106	General Chemistry . . .	3		Economics	3
Chem 107	General Chemistry Lab	1	Chem 116	General Chemistry . .	3
Engl 101	Freshman English . . .	3	Chem 117	General Chemistry Lab	1
Math 125	Elementary Analytic		Engl 102	Freshman English . . .	3
	Geometry	3	Math 226	Differential Calculus . .	3
*Elective		3	Graph 181	Graphics I	2
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		<hr/>			<hr/>
		17			15

Sophomore Year					
F Econ 301	Introduction to Micro-		AM 360	Introduction to Com-	
	Economics	3		puter Programming .	3
Engl 210	Advanced Composition		Engl 211	Technical Writing . . .	3
	and Literature	3	Math 328	Topics in Calculus . .	3
Math 227	Integral Calculus	3	Phys 104	General Physics	4
Phys 103	General Physics	4	*Elective		3
*Elective		3			
		<hr/>			<hr/>
		16			16

Junior Year					
WPE 322	Mechanical Processing	3	F Mgt 561	Operation Cost Control	3
WPE 487	Wood Structure and		WPE 502	Timber Mechanics . . .	4
	Properties	4	WPE 520	Polymeric Adhesives	
INE 548	Engineering Economic			and Coatings	3
	Analysis	3	WPE 526	Fluid Treatments	3
AM 591	Introduction to Prob-		MEE 351	Fundamentals of	
	ability and Statistics	3		Thermodynamics I .	3
MEE 225	Engineering Mechanics	4			
		<hr/>			<hr/>
		17			16

WPE: 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

SUMMER EXPERIENCE: 2 months' experience in an approved wood products or allied firm or laboratory is required. A written report, to be presented in WPE 497, is required. Usually fulfilled between the junior and senior years.

Senior Year					
ELE 221	Electrical Science I . . .	3	ELE 222	Electrical Science II..	3
INE 575	Industrial Methods and		WPE 498	Research or Design	
	Systems Engineering	3		Problem	3
WPE 570	Production Systems I:		WPE 572	Production Systems II:	
	Analysis	3		Synthesis	3
WPE 522	Composite Materials .	3	*Electives		6
WPE 497	Senior Seminar for				
	Wood Products				
	Engineering Majors .	2			
Tech. Elective		3			
		<hr/>			<hr/>
		17			15

1. *It is recommended that students elect at least 9 credit hours from the social sciences or the humanities.

2. A total of 131 credit hours is required for graduation.

Materials Marketing Option

This option is designed to prepare students for professional careers in the field of technical sales and management of distributive enterprise in the wood products and allied industries. The marketing of wood products with their related materials and services brings together the essential elements of production distribution and consumption of our renewable natural resource. Preparation for successful marketing involves development of basic knowledge of the materials and their properties, their efficient processing and fabrication, and the effective use of finished products. Because marketing channels vary widely in nature, size and complexity to meet the equally varied needs of commercial, industrial and consumer markets, preparation must also include the sound general business orientation required of any segment of the economy.

Transfers with an A.A.S. degree will be accepted with full junior standing. They are required to have at least one semester each of chemistry and physics and are recommended to have one semester each of accounting and economics. Accounting and economics may be taken after transfer with some sacrifice of elective courses and the possibility of delayed graduation.

With careful planning, students electing the Materials Marketing option may obtain the degree of Master of Business Administration from Syracuse University with one year's additional work beyond the Bachelor's.



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1. *Mathematics requirements include analytic geometry and statistics. College algebra and trigonometry may be taken in the freshman year prior to completion of these mathematics requirements in the sophomore year.
 2. **Electives are to be from the humanities or the social sciences.
 3. A total of 131 credit hours is required in this option.

WOOD PRODUCTS ENGINEERING CURRICULUM

MATERIALS MARKETING OPTION

First Semester		Credit Hours	Second Semester		Credit Hours
Freshman Year					
F Bot 100	General Botany ...	4	Pub Add 215	Public Speaking ...	3
Chem 106	General Chemistry	3	Chem 116	General Chemistry .	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English .	3	Engl 102	Freshman English .	3
*Math 015	.....	3	*Math 016 or Elective	.....	3
**Elective	.....	3	**Elective	.....	3
Phys Ed or ROTC	.....	0	Phys Ed or ROTC	.....	0
GF 032	Orientation	0			
		<hr/> 17			<hr/> 16

Sophomore Year					
Acct 204	Financial Account- ing Systems	3	Acct 205	Managerial Account- ing and Financial Decisions	3
Engl 210	Advanced Composi- tion and Litera- ture	3	Engl 211	Technical Writing .	3
*Math 125 or Elective	.....	3	*AM 571 or Elective	.....	3
Phys 103	General Physics ...	4	Phys 104	General Physics ..	4
**Elective	.....	3	F Econ 290	Introduction to Economics for Forestry	3
Graph 280	Technical Drawing .	1			
		<hr/> 17			<hr/> 16

Junior Year					
WPE 322	Mechanical Processing	3	FIN 355	Money and Banking	3
AM 360	Introduction to Computer Pro- gramming	3	WPE 520	Polymeric Adhesives and Coatings ...	3
Mktg 355	Marketing Princi- ples, Methods, and Problems ...	3	WPE 526	Fluid Treatments ..	3
WPE 487	Wood Structure and Properties	4	Mktg 356	Distribution Management ...	3
**Elective	.....	3	**Elective	.....	3
		<hr/> 16			<hr/> 15

WPE 390: Field Trip, 2 credit hours. A 2-week field trip at the end of the junior year.

SUMMER EXPERIENCE: 2 months' experience in an approved wood products or allied firm or laboratory is required. A written report, to be presented in WPE 497, is required; usually fulfilled between the junior and senior years.

Senior Year					
WPE 522	Composite Materials	3	WPE 544	Materials Marketing	3
WPE 497	Senior Seminar for Wood Products Engineering Majors	2	F Econ 520	Economics for Wood-Using Industries	3
WPE 442	Light Construction	3	Bus Law 357	The Law of Contracts	3
WPE 402	Elementary Timber Mechanics	3	FIN 356	Corporation Finance	3
Bus Law 355	Basic Concepts and Applications	3	**Elective	.....	3
**Elective	.....	3			
		<hr/> 17			<hr/> 15

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE MANAGEMENT

The School of Environmental and Resource Management offers a curriculum in Resources Management. This program prepares students for professional forestry positions.

Resources Management

This curriculum is currently in process of revision to reflect the new organizational and environmental thrust of the College. The new curriculum, which is scheduled for implementation in academic year 1973-74, retains essentially the same objectives but is designed to provide better integration of subject matter.

This is the central, accredited forestry educational program of the College. The objectives of this curriculum are (1) to provide a general and well-integrated education for professional practice as foresters and land managers, and (2) to open a broad array of natural resource-related and environmental management opportunities for the individual student to pursue his own interests and abilities in particular endeavors or through advanced study.

The core of required courses presents the principles and practices basic to sound management of extensive nonurban land areas for their many values in producing timber, wildlife, water, aesthetic and recreational uses. Over a third of our nation's area is forest land. The relationships of these valuable resources to modern society's needs and to the quality of our living environment are critical and increasing in importance. The core assures fulfillment of education requirements for all initial professional positions in Federal and state forestry, as well as the normal requirements of industrial and private enterprises in land management. Extensive elective courses serve to broaden the student's general education, to strengthen his perceptions and integration of knowledge, or to provide a solid base for those planning graduate study in resources management or its specialties.

The curriculum offers broad opportunity and maximum credit for students interested in transferring from liberal arts or science programs in community colleges or other universities.

Recommended program of courses for students planning to transfer as entering juniors totals 64 credits or an Associate degree and include:

*Physical and Biological Sciences	12-16 credits
*Mathematics	3- 9 credits
*Social Sciences and Humanities	15-23 credits
Electives	19-23 credits

Attendance at a 5-week Summer Session course in Field Forestry at the Pack Demonstration Forest, Warrensburg, New York, is required.

*Total credits in these areas should be 45.

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1. *Six credit hours of mathematics are required. Two semesters of calculus are highly recommended to be taken prior to the junior year, particularly for students interested in graduate work.
 2. **At least one of the following two courses must be chosen from these electives: Silvi 351: Meteorology and Fire Behavior, F Zool 552: Wildlife Ecology.
 3. Three elective courses (totalling 9 credits) must be selected from forestry and allied subject areas.

RESOURCES MANAGEMENT CURRICULUM

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
Freshman Year					
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Chem 106	General Chemistry . .	3	Chem 116	General Chemistry . .	3
Chem 107	General Chemistry		Chem 117	General Chemistry	
	Lab	1		Lab	1
Engl 101	Freshman English . .	3	Engl 102	Freshman English . .	3
*Math		3	*Math		3
Elective		3	Elective		3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		17			17

Sophomore Year					
F Bot 210	Dendrology I	2	F Econ 300	Introduction to	
Graph 280	Technical Drawing . .	1		Macro-Economics . .	3
F Mgt 201	Plane Surveying . . .	3	Geol 101	General Geology . . .	3
Phys 103	General Physics	4	Phys 104	General Physics	4
Electives		6	Electives		6
		16			16

SUMMER SESSION IN FIELD FORESTRY—5 weeks, 6 credit hours: Required of all students following the sophomore year and prior to registration for the junior year (including junior year transfer students who elect this curriculum).

F Biol 301	Field Biology	1
F Mgt 303	Introduction to Forest Measurements	1
Silvi 302	Silvics	1
Res Mgt 304	Silviculture-Resource Management	3
		6

Junior Year					
AM 571	Introduction to	} 3	F Mgt 522	Mensuration	3
or	Statistical		F Ento 300	Principles of Forest	
	Analysis			Entomology	2
AM 591	Introduction to		F Mgt 340	Harvesting	2
	Probability and		Silvi 521	Principles of	
	Statistics			Silviculture	3
F Bot 330	Plant Physiology . . .	2	WPE 486	Elementary Wood	
F Econ 301	Introduction to Micro-			Technology	2
	Economics	3	Elective		3
Silvi 332	Soils	3			
Electives		6			
		17			15

Senior Year					
F Econ 510	Principles of Forestry	} 3	F Mgt 572	Principles of Outdoor	} 3
	Economics		or	Recreation	
F Mgt 554	Forest Administration		Silvi 540	Forest Hydrology . .	
	and Policy	3	F Mgt 552	Management Planning	
Silvi 524	Practices of Silviculture	3		and Operations . . .	3
WPE 304	Introduction to		Res Mgt 502	Resources Management (or Other	
	Forest Products . . .	2		Forestry Elective) . .	3
**Electives		6	**Electives		6
		17			15

4. Three elective courses (totalling 9 credits) must be selected from the humanities and social science areas with at least one course from each area.
5. Additional electives should be chosen from the humanities and social science areas or from natural and physical sciences not directly related to the student's course of study.
6. A total of 136 credit hours is required in this curriculum.

THE SCHOOL OF LANDSCAPE ARCHITECTURE

The School of Landscape Architecture offers two undergraduate curricula in environmental design — a four-year program in Environmental Studies and a five-year professional program in Landscape Architecture.

Landscape Architecture

Education in the design professions today is witness to a great deal of concern for school objectives, programs, and organization. The central issue relates to the force and pace of change that characterizes the work of the environment designer and brings him into ever new challenging situations. The condition of our cities, depletion of natural resources, and pollution of our air and water all pose severe and complex threats to our society. Concurrently, a greater awareness and desire for environmental quality tax the resources and ingenuity of those in the design professions.

Several trends have emerged in recent years that suggest conditions for present and future educational programs. It is clear that an interdisciplinary approach to environmental problems is indicated and includes landscape architecture, architecture, engineering, and planning, with specific attention to the biological and behavioral sciences. It is also clear that the educational purpose must relate more directly to the health and well-being of man and be designed for versatility rather than the narrow concerns of career orientation. Finally, that contemporary education should orient the student to systems thinking in his approach to knowledge, society, and the individual.

In an effort to recognize and respond to the demands and responsibilities of our times, the following curriculum is offered in environmental studies and landscape architecture. The major characteristics of the program are:

1. An expansive frame of reference for landscape architects as major contributors to the solution of environmental problems, with a concurrent broad educational base for their professional training.
2. Provision for flexibility to accommodate shifts in educational goals, particularly within the design professions.
3. Articulation with the programs of the two-year colleges to permit ready transfer to professional programs.
4. Professional training to adequately meet the educational standards of accrediting bodies, the American Society of Landscape Architects and the Division of Professional Education of the New York State Education Department.

The curriculum is based on three consecutive educational sequences:

1. The first two years may be taken at this college or at any other school or college. Students may transfer into the freshman, sophomore, or junior programs, depending upon acceptable transfer credit. Requirements for students planning to transfer as entering juniors are as follows: (a) Associate degree or acceptable transfer credit totaling a minimum of 62 semester credit hours or their equivalent; (b) biology,

3 credits, and technical drawing, 3 credits; and (c) the equivalent of college algebra and trigonometry plus high school chemistry or physics.

A recommended course series prior to transfer would include:

English (Composition)	4 credits
English (Literature)	6 credits
Speech	3 credits
Biological Sciences	6 credits
Social Sciences	9 credits
Art Media	2 credits
Geology	3 credits
Geography	3 credits
Humanities	6 credits
Technical Drawing	3 credits
Surveying	3 credits

This series is strongly recommended but not required, except as noted above. Deficiencies in these areas will be accommodated as possible during subsequent semesters and summer school sessions.

2. The third and fourth years are devoted to a broad spectrum of courses dealing with a variety of aspects of environment and man's relationship to it, synthesized through development of ability in both the functional and creative design processes. The successful completion of this 127-hour program qualifies the student to receive a Bachelor of Science degree with a major in Environmental Studies. The education is broad but with sufficient training to focus the student's concerns for the physical environment and its significance. At this point, students may enter the field for a trial experience in professional practice, may pursue graduate study, or may apply to continue study toward the first professional landscape architectural degree.
3. The fifth year is comprised of three major components beginning with a short summer session course in plant materials. The fall semester is devoted to a unique program of off-campus study coupled with a concentration of professional course work in the final semester. The off-campus experiential studio is described and conducted by small groups of students with study topics correlated with locational opportunities throughout the world. Successful completion of this 33-hour program leads to the degree of Bachelor of Landscape Architecture, the first professional degree. Study beyond this point is accommodated by the MLA program.

LANDSCAPE ARCHITECTURE CURRICULUM

<i>First Semester</i>		<i>Credit Hours</i>	<i>Second Semester</i>		<i>Credit Hours</i>
First Year					
Engl 101	Freshman English	3	Engl 102	Freshman English . .	3
F Bot 100	General Botany	4	F Zool 100	General Zoology	4
Phil 187	Theories of Knowledge and Reality . .	3	*Electives		6
Graph 182	Art Media I	1	Graph 183	Art Media II	1
ES 100 or *Elective		3	F Econ 290	Introduction to Economics for Forestry . .	3
Phys Ed or ROTC		0	Phys Ed or ROTC		0
GF 032	Orientation	0			
		14			17
Second Year					
**English		3	**English		3
F Bot 210	Dendrology I	2	Phil 251	Logic	3
F Mgt 201	Plane Surveying	3	Graph 281	Landscape Architectural Drafting . .	3
Graph 284	Art Media III	1	EI 211	General Geography . .	3
Psych 205	Foundations of Human Behavior	3	Soc 201	Introductory Sociology	3
*Elective		3	Graph 285	Art Media IV	1
		15			16
Third Year					
LA 324	Introduction to Landscape Architecture . .	3	LA 325	Landscape Design Studio I	2
Graph 382	Graphics	2	Graph 383	Graphics	2
F Biol 320	General Ecology	3	LA 343	Structural Materials and Elements	3
LA 322	Basic Design	2	LA 345	Elements of Site Engineering	3
Electives		5	AM 360	Introduction to Computer Programming . .	3
			EI 311	Principles of Land Use	3
		15			16
Fourth Year (See Note 3)					
LA 420	Landscape Design Theory I	2	***LA 425	Orientation for Experiential Studio	3
LA 422	Landscape Design Studio II	4	LA 423	Landscape Design Studio III	4
+ LA 430	Plant Materials Culture . .	3	EI 471	History of Landscape Architecture	3
+ LA 440	Site Development Systems	3	ARC 294	Introduction to Architecture	3
+ EI 470	Art History	3	Elective		3
EI 550	Fundamentals of City & Regional Planning . .	3			
		18			16
Summer Session					

LA 433: Plant Materials. Three-week course in Plant Materials. 3 credit hours.



Fifth Year

OFF-CAMPUS PROGRAM

LA 524	Experiential Studio . .	16	LA 522	Landscape Design	}	4
			or	Studio IV		
			LA 525	Landscape Design		
			or	Studio V		
			LA 527	Landscape Design	}	
				Studio V		
			LA 545	Professional Practice		2
				Studio II		
			LA 547	Principles of Profes-		2
				sional Practice . . .		
			LA 562	Architecture		3
			Elective			3
<hr/>						
16						
						14

1. *All students must have completed the equivalent of college algebra and trigonometry plus high school chemistry or physics before entering third year.
2. **Based on individual preference and performance in first year course work; second year English courses will be determined in consultation with advisor.
3. At the beginning of the 4th year, students will state their degree intentions at Registration; applications for the Bachelor of Landscape Architecture program will be accepted during Spring Registration. Approval of the School of Landscape Architecture Faculty is necessary for admission to the Bachelor of Landscape Architecture program. Students in the terminal B.S. program may elect to take LA 524 (16 Hrs.) in place of the courses listed for the 8th semester. These students will substitute LA 425 (3 Hrs.) for one of the courses marked +.
4. ***Students in the terminal B.S. program on campus will substitute an elective for LA 425.
5. Upon successful completion of the 4th year, the B.S. degree in Environmental studies will be awarded. A total of 127 credit hours is required for this degree.
6. Upon successful completion of the 5th year, the Bachelor of Landscape Architecture degree will be awarded. A total of 160 credit hours is required for this degree.

Concentration in Environmental Studies

The College of Environmental Science and Forestry has historically provided educational programs focusing on the scientific, managerial, engineering, and design skills basic to the solution of environmental problems. The Concentration in Environmental Studies is designed (1) to provide the specialist trained in these areas with an introduction to and appreciation of the nature of man and of his institutions and their profound effect on any solution proposed for an environmental problem, and (2) to allow students in diverse areas of specialization to work together on real environmental problems in such a manner that they learn to appreciate the multifaceted nature of these problems and to work comfortably and knowledgeably with persons of diverse subject matter background.

Students electing this concentration will take a two-course sequence designed to establish an environmental awareness early in their undergraduate careers. The first of these courses — Environmental Studies 100: Introduction to Environmental Studies — will explore the cultural, socio-economic, and political factors that condition mankind's view of the environment. The second course — Environmental Studies 101: Human Ecology — will build upon the student's awareness of human values and their importance in environmental study. Students will analyze the components, first of simple and then of progressively more complex ecosystems, study the interaction of these components via the flow of energy and natural nutrient cycles, goods, and services in qualitative and simple quantitative terms, and finally, impose and evaluate the influence of man's attitudes and value systems on these ecosystems. Subsequently, as the student's disciplinary competence develops, he will elect at least two seminars (Environmental Studies 497), and two hours of problems courses (Environmental Studies 498). These are designed to provide students of diverse backgrounds to bring their special skills to focus and to work together on problems of environmental importance.

In addition to the courses listed above, and the course requirements of the diverse curricula of the College, there are a wide diversity of additional courses available for election of students interested in environmental studies, provided elective hours are available. Members of the Undergraduate Environmental Studies Advisory Group are available to discuss these with the students.

This program will educate a person to both a disciplinary specialization and a keen appreciation of how this specialization can be applied in the environmental decade of the "70's."

IX
SUMMER SESSIONS



SUMMER SESSIONS

A wide array of courses at the undergraduate and graduate levels is available to College of Environmental Science and Forestry students in the Syracuse University summer sessions. Research problems, theses, and special courses regularly available at the College may also be taken during the summer sessions. Syracuse University courses taken must be an integral part of the student's planned program and *be approved by his faculty advisor*.

Transfer students are advised to review their special course needs with the Office of Admissions and to consider summer session attendance where completions of background courses in mathematics, chemistry, economics, or general education subjects are necessary for fall semester entry in full standing. Information on courses available on the Syracuse campus, session dates, and registration procedures are available upon request from the Office of Student Affairs or the Graduate Affairs Office at the College. Summer session tuition charges at the College for New York State residents are \$21.50 for undergraduate lower level students, \$26.75 for undergraduate upper level students, and \$40.00 for graduate level students. Tuition charges for nonresidents of New York State are correspondingly \$35.75, \$43.50, and \$50.00 per credit.

SUMMER SESSIONS IN FIELD FORESTRY

**Charles Lathrop Pack Demonstration Forest
Warrensburg Campus
Warrensburg, New York**

A five-week (6-credit) program of courses emphasizing the field application of forestry principles and practices is conducted in two sessions each summer at the Pack Demonstration Forest near Warrensburg, New York. These sessions are coordinated with College and Syracuse University summer sessions, permitting students to attend an on-campus session and a field session in the same summer. The courses presented in the Field Forestry program are listed in both the Forest Biology and Resources Management curricula sections. Room, board, and fee charges approximating \$175 are levied. No tuition charge is made for matriculated students since the courses in this session are coordinated with and considered an integral part of the fall semester of the junior year. *Transfer students* planning to enroll in either the Resources Management or Forest Biology curriculum should write to the Director, Summer Session in Field Forestry at the College for additional information on session dates and special requirements.

Completion of the Field Forestry program is required of students in Resource Management prior to the fall term of their junior year. Students in Forest Biology are also required to attend either this session or the session at Cranberry Lake Biological Station, although attendance at other approved biological field stations may be arranged with the Curriculum Director.

SUMMER SESSION IN ENVIRONMENTAL BIOLOGY

Cranberry Lake Biological Station

Charles Lathrop Pack Demonstration Forest

Cranberry Lake Campus

Cranberry Lake, New York

The Summer Session in Environmental Biology provides graduate students and selected undergraduate biology majors with the opportunity to continue their studies and research at a lake-and-forest field station. The summer program is jointly sponsored by the School of Biology, Chemistry and Ecology of the State University College of Environmental Science and Forestry and the Department of Biological Sciences at the State University of New York at Albany. Qualified students from other institutions are welcome.

Cranberry Lake and its environs are ideally suited for an advanced biology summer program. The surrounding topography is rolling hill and lake country dotted with numerous small ponds, closed bogs, and stream drainages. The lake itself is the third largest body of water in the Adirondacks. Because eighty percent of the shoreline is in State ownership, the lake remains relatively unspoiled by recreational developments and is free of pollution problems. Much of the original forest cover in the region was harvested years ago; today a rich variety of community types occupy those sites as the vegetation reverts again to the natural forest condition. The remaining virgin forests also provide the student with many examples of stable forests, each type reflecting the particular environmental conditions controlling forest development. A wealth of wildlife parallels the variety of cover types over the region. The area is centrally located providing easy access to a wide range of additional ecosystems ranging from bog to alpine types.

Facilities include four classroom-laboratories; dining facilities capable of serving 150; faculty quarters and cabins; a headquarters building; 12 cabins housing 6–8 students each; a recreation hall; and several smaller, supporting buildings. Isolated across six miles of water, the Station generates its own electrical power and provides a running water and sanitation system. Telephone service is available to the outside, and mail is delivered to the Station daily. At least one boat trip a day and several on the weekends are made to the marina or village.

The eight-week program extends from late June into mid-August and is divided into two four-week sessions. Courses are taught in blocks of two-day units, permitting concentrated study without hourly interruptions. Because the Cranberry Lake Biological Station is the only field biology station in the State University system stressing graduate training, all courses are presented at a rigorous, advanced pace. College of Environmental Science and Forestry students planning to attend should be preparing for graduate study. Completion of their junior year biology sequence with a six-semester minimum cumulative average of 2.5 is recommended.

Courses in the 500-level are open both to upperclassmen and graduate students; the 700- to 900-levels are restricted to qualified graduate students.

All courses require a minimum biological background of 15 hours of biology, including at least one course in general ecology; additional prerequisites for individual courses are listed in the course descriptions.

Courses Offered Each Year

<i>Number</i>	<i>Title</i>	<i>Credits</i>	<i>Duration & Session</i>
F Biol 497	Seminar in Forest Biology	1	8 weeks I-II
F Biol 498	Research Problem in Biology	1-3	4-8 weeks I-II
F Biol 515	Advanced Limnology	4	8 weeks I-II
F Bot 517	Adirondack Flora	2	4 weeks I
F Biol 521	Ecology of Freshwaters	2	4 weeks I
F Bot 522	Ecology of Forest Communities	2	4 weeks II
F Zool 524	Vertebrate Ecology	2	4 weeks II
F Bot 527	Bryoecology	2	4 weeks I
F Bot 798	Research in Forest Botany	TBA	8 weeks I-II
F Zool 798	Research in Forest Zoology	TBA	8 weeks I-II
F Ento 798	Research in Forest Entomology	TBA	8 weeks I-II
F Biol 997	Biology Seminar	1	8 weeks I-II

Courses Offered Alternate Years

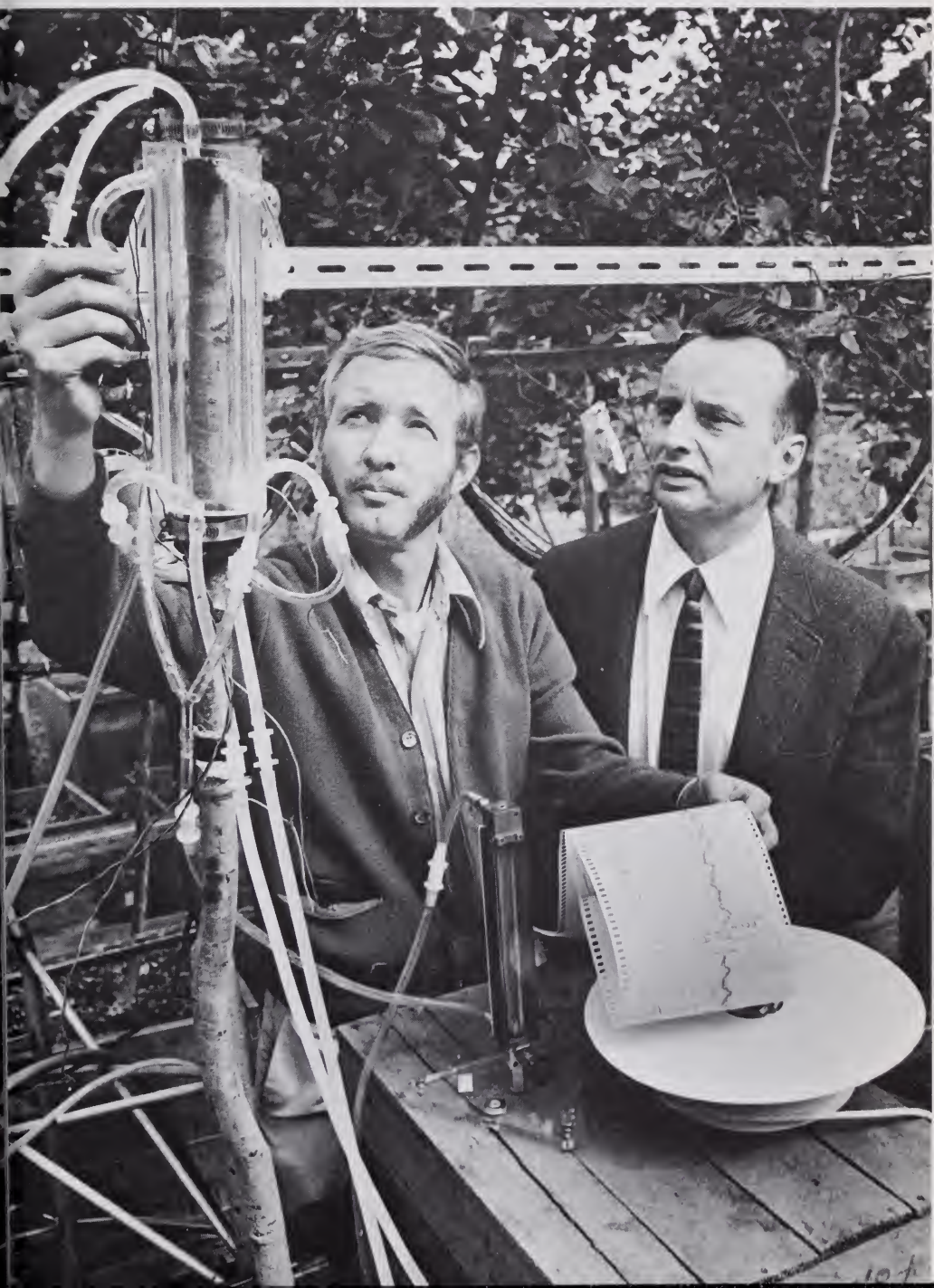
F Bot 512	Phycology	2	4 weeks II
F Zool 523	Invertebrate Ecology	2	4 weeks I
F Zool 526	Ecology of Adirondack Fishes	2	4 weeks II
F Ento 550	Forest & Aquatic Insects	2	4 weeks I
F Zool 575	Behavioral Ecology	2	4 weeks I
F Biol 720	Physiological Ecology	2	4 weeks I
F Biol 721	Population Dynamics	2	4 weeks II
F Biol 722	Bioclimatology	2	4 weeks II

Maximum course load is 4 credits each session or 9 credits for the two sessions.

State University tuition charges prevail at the Biology Station; Seniors pay \$26.75 a credit if State residents and \$43.50 if out-of-state; graduates from New York are charged \$40.00 and nonresidents \$50.00. Room and board charges are \$120.00 each session. Syracuse students register at the College of Environmental Science and Forestry through the Associate Director; all other students register through the Academic Program Director, Department of Biological Sciences, SUNY Albany, 1400 Washington Avenue, Albany, N. Y. 12222. Because facilities at the biology station are limited, applications should be received prior to May 1; late registration is accepted as space permits.

X

GRADUATE STUDY



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INTRODUCTION

Society is increasingly in the hands of those who have broad foresight and reasoned judgment in applying sociological and technical knowledge to guide human and environmental forces. Modern civilization — with its compelling demands from industry, government, and educational institutions — requires persons who think objectively and constructively, and who act creatively and responsibly.

A purpose of the graduate years is to develop these persons. These years are a time of discovery and excitement, a time of answers and new insights, a time of personal productivity and contributions to scholarship. It is during the graduate education that the student develops his ability to think critically and analytically, to plan research, to design experiments, to work effectively with the basic research tools as well as specialized equipment, and to undertake the discipline of purposeful study toward a specific goal.

From its beginnings, the College of Environmental Science and Forestry urged its more capable undergraduates to meet both professional and career needs by taking an extra year of graduate study. At the College, stimulating background for advanced education comes from the interaction of faculty and students working together, amidst excellent supporting facilities and equipment, to solve challenging environmental problems. Against this background, the graduate student takes a program of advanced courses designed to meet his personal, professional and academic objectives; he participates in seminars and colloquia with the faculty and visiting scholars.

All this is a prelude to the most significant feature of his graduate work — the concentrated individual study and research leading to the preparation of a thesis.

GRADUATE FACULTY

The College faculty numbers about 160, with a Graduate Faculty of over 120 members. The directory on pages 164–181 gives the title and academic degrees of each individual. Those who are members of the Graduate Faculty are marked with an asterisk (*).

The departmental descriptions given on pages 93–112 indicate the faculty of that department and their areas of special research interest. Also, members of College University research centers and institutes participate in and direct graduate student programs.

GRADUATE RESEARCH

Research is a vital part of the intellectual experience of most graduate students. The advanced scientific, technical and professional education at the College usually culminates in original inquiry of significance under the guidance of a group of distinguished faculty. In carrying out his investigation, the student becomes a partner in the College's pluralistic research endeavor. For example, he may participate in the discovery of new principles and basic understanding of the physical world; he may probe into the foundation of life; or he may elucidate the complex inter-relations found in a wetlands ecosystem. The student may formulate the institutional arrangements designed to promote public policy, design a regional land-use system, develop a decision model for management of public lands, or analyze the role of wildlife as indicators of environmental quality.

Sophisticated modern facilities provide research opportunities which require advanced techniques. Included in the array of analytical tools are 100 MHz Nuclear Magnetic Resonance and Mass Spectrometers, and Transmission and Scanning Electron Microscopes (the latter with capability for X-ray energy dispersion analysis). A photogrammetry and remote sensing laboratory, pulping and papermaking facilities including a commercial size paper machine, a computer center with third-generation hardware, specialized insect and animal rearing centers and many controlled environmental rooms, are a few of the laboratory resources available for graduate research. In addition, there are 25,000 acres of field laboratories representing a wide array of ecological types where research and educational programs are conducted year around.

The research tradition at the College, now in its 62nd year, is a key ingredient in the exciting milieu characterizing graduate study. The bold and innovative research reputation enjoyed by the College among its many governmental, industrial, scientific and professional clientele attracts students from diverse backgrounds and interests, together with large numbers of visiting staff who come to study and to teach, and thereby enrich the graduate experience of all.

POSTDOCTORAL TRAINING

The College of Environmental Science and Forestry has long had an informal postdoctoral study program which is closely related to the College's research effort. One or two years of advanced study enables an individual to obtain both a diversity of experience in a highly specialized area and more intensified training for his chosen career. Postdoctoral students are usually sponsored by an individual faculty member who provides the support and arranges for the needed facilities.

SYRACUSE UNIVERSITY

Chapter 851 of the New York State Education Law of 1911 established at Syracuse University a State College of Forestry which was to be known as "The New York State College of Forestry at Syracuse University." In 1948, with the creation of the State University of New York, the College became a specialized unit within the system. In 1972, by special legislative act, the College of Forestry was renamed the State University of New York College of Environmental Science and Forestry to indicate more clearly the traditional grounding and concern of forestry in the environment.

The Syracuse campus of the College of Environmental Science and Forestry consists of six major buildings on a 12-acre campus which is immediately adjacent to the campus of Syracuse University. This juxtaposition of a State-operated college and a large, privately-operated University Center is a stimulating environment for graduate education.

As one of the large and academically excellent private institutions of the United States, Syracuse University, with its more than 4,000 graduate students, has resources and facilities that complement and supplement the offerings of the specialized College. Graduate students at the College of Environmental Science and Forestry have all the privileges of students of Syracuse University. They are encouraged to make use of the University Center's many social, athletic and cultural activities.

EXCHANGE OF GRADUATE STUDENTS

Formally admitted degree graduate students in any unit of the State University of New York may be authorized to take courses at the State University College of Environmental Science and Forestry without going through the usual application and admission procedures. Such exchange students must have the necessary prerequisites for the course, or permission by the instructor, and there must be available room in the course. These matters will be decided by the professor and department chairman or School Dean involved and handled through the Office of Graduate Studies.

Admittance as an exchange student will require a statement from the student's Department Chairman indicating the course (or courses) involved, and that the course (or courses) will be accepted toward completion of his degree requirements. Whenever feasible, the student will pay appropriate tuition and fees for the course(s) at his institution. If the student has a waiver of tuition at his institution, that waiver (tuition receipt) will be recognized at the College. This authorization will apply *only* to College of

Environmental Science and Forestry courses, not to Syracuse University courses.

REQUIREMENTS FOR DEGREES

Graduate programs are flexible and developed individually. Each program is planned by the major professor with the student to meet his particular academic and professional needs. Sometimes this includes undergraduate courses for which no graduate credit can be given. In every case emphasis is placed on outlining a study program leading to a high level of scholarly achievement.

An entire program for each student is planned and must be approved by the major professor, department chairman, and School Dean. The program is modified as required upon recommendation of the major professor. A thesis committee consisting of the major professor and two other faculty members is appointed early in each student's study program. In some departments, all graduate students are required to engage in an appropriate teaching assignment as an academic degree requirement.

Master. All programs leading to the Master of Science, Master of Forestry, and Master of Landscape Architecture degrees require at least 30 semester hours of graduate credit. At least half of the credit must be in courses numbered 600 or above. Graduate-level course work (passed with an average grade of at least B) takes up 12 to 24 hours. The remaining credit-hour requirement is met by submitting a thesis presenting the results of original research. Acceptance of the thesis depends on clear demonstration of ability to search and evaluate pertinent literature independently, to



plan and carry through independent and important investigation, to interpret the significance of findings, and to present the subject in a well-organized, lucid, and scholarly thesis. The student must pass a final oral examination in which he defends his thesis and demonstrates his knowledge of related subject areas.

Candidates for Master degree must spend at least two semesters in residence at the College of Environmental Science and Forestry.

Ph.D. Quality of work is especially emphasized for the Doctor of Philosophy degree. The student is required to penetrate the frontier of knowledge in his particular field and make a definite contribution to this knowledge. He is required to demonstrate original scholarship of a high order in his search and evaluation of literature, in the planning, execution, and interpretation of his own research, and in the presentation of his findings in a thesis. Subsequent publication in a scholarly journal is expected.

There is no minimum credit hour requirement for the Ph.D. Each student must pass a qualifying examination before being admitted to candidacy. This two-part examination consists of a preliminary examination taken early in the period of residence to assist in planning a course work and independent study program, and a written and oral comprehensive examination to test breadth and depth of knowledge. There is no College-wide language requirement. However, competence in a foreign language, statistics, computer programming, or other "tools" may be required where they are relevant to the student's field of study. A candidate for the Ph.D. degree with only a Bachelor degree must be in residence for at least two full academic years. A candidate having a Master's degree must be in residence for at least one full academic year. The final requirement is the presentation and defense of the Ph.D. thesis or dissertation which must represent an original contribution to knowledge.

ADMISSION REQUIREMENTS AND PROCEDURE

Admission to graduate study may be granted only to applicants with at least a Bachelor's degree from a recognized institution, whose preparation has been suitable in quality and content for the proposed field of major study. Applicants will be evaluated on the basis of the following: (1) their academic record should show approximately a "B" or 80% average for the junior and senior years; (2) Graduate Record Examination Aptitude scores and in some cases, subject matter (advanced) tests indicative of graduate study ability; (3) supporting letters of recommendation, and (4) where appropriate, other evidence of scholarly achievement and potential. Admission is selective with priority given to applicants who have high scholastic standing.

All applicants are required to submit Graduate Record Examination aptitude scores. Where subject matter (advanced) test scores are required, they are indicated in the departmental statements which follow. In some instances GRE scores may not be required for applicants who have completed a Master's degree at an American university; however, these scores are essential in award of financial assistance. This examination is offered

several times per year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540. Test scores should be sent to the Office of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210 (Institutional number R2530).

The College provides a special form for application for graduate work. Requests for information and applications should be addressed to the Office of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210.

INTERNATIONAL STUDENTS

Citizens of other countries with special educational objectives are accepted for graduate study in all programs. They must show satisfactory evidence that they have completed studies in their major field equivalent to those at a recognized American institution with a scholastic record equivalent to a B average in their junior and senior years. They must submit Graduate Record Examination scores as explained in the section on Admission Requirements. Also, applicants whose native language is other than English must submit scores on the Test of English as a Foreign Language (TOEFL) as an indication of their ability with the English language. This examination is offered several times per year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. In submitting test scores, request that they be sent to the Office of Graduate Studies, State University College of Environmental Science and Forestry, Syracuse, New York 13210.

International students who have completed a Bachelor's or Master's degree at an American college may be admitted as graduate students. They must apply for admission as explained in the section on Admission Requirements. In this case the requirement of TOEFL scores may be waived.

EXPENSES

Tuition and Fees

Graduate tuition fee charges are \$600 per semester for residents of New York State, and \$750 per semester for others. Student activity fees are approximately \$25.00 per year. Expenses for textbooks and supplies average \$125.00 or more a year. A commencement fee of \$25.00 for Master recipients and \$50.00 for Doctoral recipients is charged at the time of graduation.

All graduate students are required to have accident and sickness insurance. Graduate fellows funded through the State University Research Foundation are required to take the health and accident insurance available through the Foundation.

Housing

The College does not operate dormitories or student residences. These are facilities of Syracuse University. Furnished and unfurnished apartments

for families, single graduate students and upperclass undergraduates are located on the South Campus, approximately two miles from the Main Campus, and are served by a regular shuttle-bus. Plans for long-term development of this area include the immediate construction of several hundred new apartment units ranging from one to three bedrooms. Any student who wishes to live in University housing should write to the Director, Married Students' Housing, 1528 East Colvin Street, Syracuse, N. Y. 13210. Formal admission to graduate study is required before such requests are granted.

In addition, a wide variety of living arrangements in private homes and apartment complexes are available in the metropolitan Syracuse area.

FINANCIAL ASSISTANCE

The College awards a substantial number of assistantships, fellowships, and scholarships to qualified graduate students each year. The number of students receiving these awards varies from year to year, but usually more than half of all graduate students have received such support. In many cases it is not possible to provide a stipend at the start of the graduate study period, but such support is often provided after the student has demonstrated his competence.

Students may indicate their interest in a type of financial assistance on the last page of the graduate application form. Students on fellowships or assistantships must devote full-time to graduate study. Students seeking financial assistance should be sure their application and supporting documents reach the Office of Graduate Studies before March 1, to ensure full consideration for an award for the following semester.

Graduate Assistantships

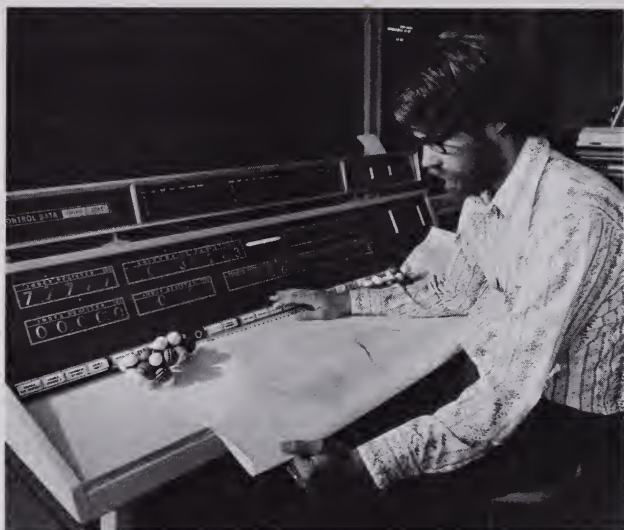
Assistantships are awarded students of demonstrated scholarship whose education and experience enables them to assist in laboratory instruction and research. The amount of the assistantships is approximately \$3,400 per year. In addition, tuition is usually waived. Students on assistantships must carry 12 credit hours of course work, including research, per semester.

Special Fellowships and Assistantships

Fellowships and assistantships sponsored by industries, associations, and foundations are available in several departments. The amount of stipends varies. Holders of these special fellowships and assistantships are required to confine the major part of their research activities to definitely specified fields. Tuition is either waived or provided by sponsors.

Tuition Waiver Scholarships For Foreign Students

Tuition waivers may be awarded to a limited number of foreign students judged to possess special academic capabilities and with demonstrated financial need, who are prepared to contribute to furthering international understanding and good will. Requests for such tuition waivers may be made on the last page of the graduate application form.



Scholar Incentive Program

Qualified New York State residents are eligible for Scholar Incentive Program grants and State University Grants-in-Aid which vary with the net taxable family income of students, and the level of study, and provide substantial reductions in tuition. For details, contact the Financial Aids Officer at the College.

Loans

Graduate students may be eligible for various types of educational loans. The New York Higher Education Assistance Corporation offers loans to residents which are interest free until after college, and then charges 7 per cent annual interest under current regulations. Repayment terms are arranged after graduation.

A graduate student who is a U.S. citizen may borrow up to \$2,500 a year under the Student Loan Program of the National Defense Education Act of 1958. No interest will accrue until 9 months after leaving college, and then it is at 3 percent. Part of the loan will be canceled if the student becomes a public school teacher or college teacher or enters military service. A 10-year repayment period is allowed.

Other Forms of Self Support

A limited number of graduate students without assistantships or fellowships may be employed at an hourly rate to assist in laboratories and other College activities. Such hourly employment does not include free tuition.

Employment also may be sought on a part-time basis through Department Chairmen, the Student Services Office of the College, or the Syracuse University Placement Office.

SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

STUART W. TANENBAUM, *Dean* (Microbial Ecology, Microbial Metabolism, Fungal Ecology and Physiology)

Forest Botany and Pathology

TEPPER, *Chairman* (Anatomy and Morphogenesis); AMES (Morphogenesis); GEIS (Ecology); GRIFFIN (Mycology and Fungus Physiology); KETCHLEDGE (Ecology and Bryology); LOWE (Mycology); MANION (Pathology); MCDOWELL (Fungus Physiology); RANDALL (Taxonomy and Ecology); SCHAEDEL (Physiology); SILVERBORG (Pathology); VALENTINE (Genetics); WANG (Mycology); WILCOX (Physiology of Growth and Development); ZABEL (Wood Deterioration).

The program in botany and pathology is designed to provide students with graduate level instruction in basic botanical and related natural and physical sciences. Research and thesis problems are generally designed to utilize forest organisms in the development of biological knowledge. Graduate programs are offered in the fields of anatomy, morphogenesis, physiology-biochemistry, ecology, forest pathology, wood deterioration, mycology, genetics and taxonomy. Strong supporting courses in climatology, meteorology, soils, ecology, bacteriology, botany, microbiology, genetics, mathematics, chemistry and statistics, available in other departments at the College and at Syracuse University, provide additional studies for graduate programs.

Current areas of active research by departmental faculty are: *Anatomy and morphogenesis*, factors that influence the development and form of root systems and regulate the development of root and shoot apices, cell differentiation in tissue culture; *physiology*, chemical regulation of organ growth, the nature and physiology of mycorrhizae, ion transport, mineral nutrition, biochemical aspects of cambial physiology, photosyntheses; *ecology*, dynamics of plant communities in the Adirondack Mountain Region and on the Alleghany Plateau, the influence of man on plant communities, the interaction of environmental factors during vegetational change, phytogeography and chemical ecology; *forest pathology*, disease of forest plantations, heart-rots and cankers, tree rusts and physiogenic diseases; *wood deterioration*, the effects of stains and decays on wood use and their controls, the chemistry of wood decay, toxicity mechanisms, and the bio-assay of toxicants; *mycology*, the taxonomy, sexuality, and morphology principally of wood-inhabiting fungi and microfungi; *fungus physiology*, the role of nucleic acids and intermediary metabolism in growth and morphogenesis; *genetics*, quantitative and population genetics, the heritability and natural variations in wood characteristics that are important in forest products and wood pulp; *taxonomy*, the identification, nomenclature and classification principally of fungi, bryophytes, and vascular plants.

Illick Hall, the biological science building, provides faculty and students with modern facilities for botanical research. Special facilities include roof-top greenhouses; growth chambers; herbaria and special research labo-

ratories for tissue culture, microchemistry, microtechnique, microscopy, radiochemistry, chromatography, and computation. In addition, a cobalt-60 source, electron microscopy laboratory, and a computer center are available at the College for student use. Extensive College forests, including most forest types of the Northeast, plantations, and nurseries offer exceptional opportunities for field study of forest plants and diseases.

Research in the department is supported by private industry, the United States Forest Service, the Department of Environmental Conservation, the Research Foundation of the State of New York, a variety of Federal agencies and by the State. In addition to direct project support, the grantees also provide for graduate research assistantships.

Forest Entomology

SIMEONE, *Chairman* (Ecology and Wood-Inhabiting Insects); ALLEN (Ecology and Population Dynamics); BREZNER (Physiology); CAMPBELL (Population Dynamics); KURCZEWSKI (Morphology, Taxonomy, Behavior); LANIER (Ecology, Cytotaxonomy); MORRIS (Medical Entomology); NAKATSUGAWA (Toxicology).

Opportunities for the study of forest entomology are available for the graduate student who, with the advice of his major professor, is permitted to follow a program of research supplemented by appropriate course work at this College and at Syracuse University. On-going research includes not only classical biological studies of forest insects and those causing the deterioration of wood, but also diverse possibilities such as host-parasite relationships, host selectivity, population dynamics, insect physiology, dehydrogenases, mechanisms and enzymology of insecticide detoxification, biochemical systematics, comparative behavior, insect communications, taxonomy, histology and cytology. Selected problems may also concern the economic impact of forest insects as well as chemical, biological, and silvicultural aspects of insect control.

Interdisciplinary pursuits are encouraged in chemical ecology, genetics, forest pathology, vertebrate entomology, immunology, and climatology involving other departments at this College, Syracuse University, and the Upstate Medical Center of State University of New York. Areas of specialization are enhanced by supporting courses in these other disciplines. Students interested in insect ecology, chemical ecology, physiology or taxonomy, for example, may pursue these subjects relative to plants and other animals by selecting courses in forest botany, silviculture, forest zoology, biochemistry, and applied mathematics.

Students and faculty have a wide range of field and laboratory facilities available for research. The several forest properties represent varied forest environments while Illick Hall provides modern controlled facilities and instrumentation. More than 18,000 square feet of indoor space is available, with access to electron microscopy laboratory, including scanning electron microscopes, environmental chambers, ultra centrifuges, nuclear magnetic resonance equipment, gas chromatograph, isotope laboratory, cobalt source for irradiation, a sound-proof room, glasshouse, and an

insectary complex affording subsection of insects to controlled as well as ambient weather conditions. The taxonomic museum houses nearly 100,000 insect species deposited by entomologists for more than half a century. A computer center provides services in all phases of entomological research.

Forest Zoology

ALEXANDER, *Chairman* (Vertebrate and Wetland Ecology); BEHREND (Forest Wildlife Ecology and Management); BROCKE (Bioenergetics and Wildlife Ecology); CHAMBERS (Wildlife Ecology and Management); DINDAL (Invertebrate Ecology); GRAVES (Physiological Ecology); HARTENSTEIN (Invertebrate Physiology); PAYNE (Wildlife Conservation); PRICE (Animal Behavior); TIERSON (Forest Wildlife Management); VANDRUFF (Vertebrate Zoology and Wildlife Ecology); WEBB (Vertebrate Ecology and Forest Wildlife Management); WERNER (Limnology and Aquatic Ecology).

Graduate studies in forest zoology include both basic and applied research on animals of our natural ecosystems, including their associated soils and water. Programs are offered in vertebrate ecology, soil invertebrate ecology, endocrinology and physiology, population ecology, animal behavior, forest wildlife biology, aquatic ecology, and forest wildlife management.

The Department and its laboratory facilities are located in the biological sciences building. They include specialized laboratories for research in physiology, soil invertebrate ecology, animal behavior, aquatic biology and wildlife biology. An extensive collection of invertebrates is available, as well as the large Roosevelt Wildlife Collection. Various temperature-humidity chambers are available, including an environmental simulating chamber which programs and records light, temperature, humidity, altitude, wind, and precipitation.

The Department has an intensive research program in wildlife biology open to graduate students on the Archer and Anna Huntington Wildlife Forest, a 15,000-acre forest in the Central Adirondack Mountain region. Many forest types are present in varying stages of management. Four faculty members are year-round residents on the area.



Field research may also be conducted on the College's Heiberg Memorial Forest and Experiment Station. Several other areas are located within a 35-mile radius of Syracuse, and frequently are used for research purposes. These include Onondaga County's Highland Forest; the Department of Environmental Conservation's wildlife management areas — Tioughnioga, Three Rivers, Howland Island, and Cicero; the Montezuma National Wildlife Refuge; and privately-owned lands. A wide variety of ponds, streams and lakes in Central New York are regularly used by graduate students in aquatic ecology and fishery biology. Also, various forests, fields, aquatic areas and waste beds are used for invertebrate investigations.

These facilities and areas are supplemented by the services and facilities of the College's other departments, particularly the Departments of Forest Botany and Pathology, and Forest Entomology. The School of Environmental and Resource Management provides support in relating the managerial and silvicultural facets of forest resources to animal ecology study programs. The College is adjacent to Syracuse University with its large Department of Biology, strong in physiology and developmental zoology. Available through this institution are programs in social sciences and engineering, including land use and environmental pollution.

The State University Upstate Medical Center also is nearby. Its facilities are available for graduate students whose research can be benefited by their specialized library, equipment, and faculty.

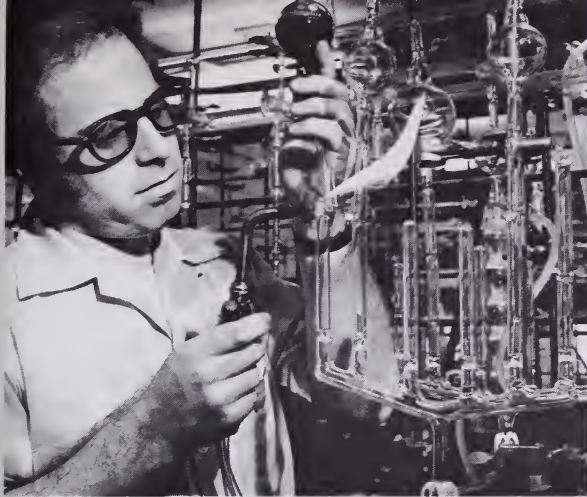
Examples of recent research include the ecology of forest wildlife species, movements of larval fish, domestication of Norway rats and pheasants, marsh ecology, hematology of woodchucks and game birds, wetland planning, nesting behavior, deer behavior, physiology of isopods, pesticides and soil fauna, physiology of hibernation, and the population dynamics of deer.

Chemistry (Polymers, Natural Products, Biochemistry)

SMITH, *Chairman* (Physical and Polymer Chemistry); LALONDE (Organic and Natural Products Chemistry); SARKO (Physical and Polymer Chemistry); SCHUERCH (Wood and Polymer Chemistry); SILVERSTEIN (Ecological Chemistry); SMID (Physical and Polymer Chemistry); SONDHEIMER (Biochemistry); SZWARC (Physical and Polymer Chemistry); TIMELL (Wood Chemistry); WALTON (Biochemistry).

Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance to forestry and the environment. Therefore, this department is very active in the following research areas: polymer chemistry and physics, wood chemistry, biochemistry, chemistry of natural products including ecological chemistry, and organic material sciences. (See also Interdisciplinary Program in Organic Materials Science.)

Requirements for a Master of Science or Doctor of Philosophy degree in chemistry include a research project and thesis, along with an appropriate program of courses at the College and at Syracuse University. Financial



support is available to foreign students and postdoctorates in the form of fellowships, teaching assistantships, and tuition waivers.

Specific projects may vary from year to year, since they reflect the current interests of the department members. Current research projects with physico-chemical emphasis are: the chemistry, physics, solid state and solution properties of natural and synthetic polymers, including studies in thermodynamics, statistical mechanics, crystallization, morphology, elasticity, conformation of macromolecules, optical properties, polymer catalysis, mechanism of polymerizations, polyelectrolytes, ion binding to macromolecules and ion pairing; chemistry of free radicals, radical ions and charge transfer processes; structure and properties of ionic solutions in nonaqueous media; crystal structure and morphology of cell wall constituents. Current organic chemistry programs deal with synthesis of special polymers such as high temperature aromatic block, stereoregular vinyl polymers, and polysaccharides, various aspects of natural products chemistry, but especially alkaloids and terpenes, isolation and characterization of insect and mammalian attractants. An active program on the structure and topochemistry of the polymeric wood components, hemicelluloses, lignins and celluloses is underway. In biochemistry, department members are studying mechanisms of action of plant growth hormones, biochemical regulation of seed germination, plant enzymology, and ultrastructural plant cytology.

Graduate research laboratories in the Hugh P. Baker Laboratory are well equipped for polymer studies, chemical, and biochemical research. Instrumentation includes analytical and preparative ultracentrifuges, Warburg respirometer, recording infrared and ultraviolet spectrophotometers, mass spectrometer, differential refractometer, electron spin resonance spectrometer, nuclear magnetic resonance spectrometer, automatic membrane osmometers, solid and solution state light scattering photometers, recording polarimeter and optical rotatory dispersion spectrometer, several ultramicrotomes, electron microscopes, X-ray diffraction, instrumentation chromatography and cold laboratories, and radiochemical laboratories with counters for solids, liquids, and gases.

SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

ROBERT V. JELINEK, *Dean* (Computer Applications in Education, Process Engineering and Simulation, Corrosion)

Empire State Paper Research Institute

DENCE (Organic Chemistry and Lignin Reactions); LEOPOLD (Organic Chemistry and Mechanical Properties of Fibers and Paper); LUNER (Mechanical and Surface Properties of Fibers, Films, and Paper); MARK (Fiber Physics); MARTON (Paper Properties, Microscopy, and Pulping).

Paper Science and Engineering

O'NEIL, *Chairman* (Pulping, Bleaching and Paper Properties); GORBATSEVICH (Pulping, Bleaching, Paper Technology, and Paper Properties); STENUF (Chemical Engineering, Instrumentation, Thermodynamics, Process Control, Metallurgy and Corrosion); STRAUSS (Paper Properties, Paper Coating, Pulping, and Bleaching).

The pulp and paper industry is one of the most rapid in rate of growth among all major American industries and is fifth largest in the nation. The need for professional men with advanced education in science, engineering, and technology is increasing at a rate more rapid than the growth of the industry. The College pioneered in providing graduate study in this area in 1920 with the organization of the Department of Paper Science and Engineering.

Since its inception, the Department has maintained a singularly high position in professional education in providing personnel for the continuing development of the pulp, paper, and allied industries. Its graduates, who are in constant demand, are located throughout the world.

The graduate program reflects the strong trend toward diversification in the industry and offers opportunities for obtaining Master of Science and Doctor of Philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Advanced courses are offered in such diverse



areas as engineering, physical and organic chemistry, polymer chemistry, paper physics, and fiber morphology, as well as specific areas of pulping and paper properties.

Major research areas in the Department are: chemistry of pulping and bleaching; physical properties of fibers; characteristics of the paper web; chemical engineering operations as related to the pulping and papermaking processes; utilization of new raw materials; flow properties of papermaking materials.

Walters Hall, opened in 1969, is devoted exclusively to education and research in this field. It contains a large number of research and special purpose laboratories which house sophisticated equipment. This new facility will enhance the existing graduate program.

The research program is designed to generate new information regarding the fundamentals, the science, the engineering and the technology of the papermaking process as a contribution towards progress and the future development of the industry. Those efforts are made possible by the use of advanced techniques such as electron microscopy, specialized spectrophotometry, nuclear magnetic and electron spin resonance and nuclear tracer techniques, all within the framework of one of the outstanding research facilities in the field. Also included is a modern clinical engineering laboratory designed for studies in all phases of unit operations, processes, process control, and thermodynamics.

The Department maintains an experimental pulp and paper mill equipped with machinery and instrumentation for studies in many facets relating to this industry. These studies include pulping, pulp purification, reuse of secondary fibers refining, investigations of paper additives, and papermaking. This facility includes a paper machine, a 400 horsepower double disk refiner, a two-pocket grinder for mechanical pulping and auxiliary equipment.

Recent research has been directed to fundamental studies of pulping, bleaching, additives, recovery of secondary fibers, the papermaking process, reactions of wood components during mechanical and chemical treatments, evaporation, fluid dynamics, heat transfer, the structure of wood and wood fibers, and chemical and fiber recovery.

Wood Products Engineering

DAVIDSON, *Chairman* (Organic Materials Science); ANDERSON (Wood Quality-Growth Relations); CÔTÉ (Cellular Ultrastructure); DE ZEEUW (Wood Anatomy, Structure-Property Relations); MEYER (Wood-Polymer Systems, Radio Isotope Techniques); MOORE (Bonded Materials Technology); PENTONEY (Mechanical Behavior, and Fracture Mechanics); SIAU (Protective Treatments, Transport Processes); SKAAR (Wood Physics); G. SMITH (Materials Marketing); WHITT (Industrial Engineering).

While wood is one of the oldest structural materials known to man, its economic importance today is reflected in the fact that the annual tonnage of wood produced in the United States far exceeds that of any of the other



major structural materials. This fact becomes even more important in this age of environmental and ecological concern because wood is the only major structural material that comes from a renewable natural resource. In common with the rest of the materials industry pressure is continuously applied for more efficient utilization of the available material. It is also clear that improved efficiency must be based on solid scientific and engineering information. Thus research projects aimed at providing such information form the basis of the graduate program in the department. The major areas of specialization are: Wood Science, Wood Products Engineering (with emphasis on either structures or production systems) and Product Distribution Systems.

Basic degree requirements for either a Master of Science or a Doctor of Philosophy degree include an appropriate course work program which prepares the student to undertake a research project which culminates in the writing of a thesis. Limited financial support is available to both U.S. and foreign students.

In recent years research projects in the wood ultrastructure area have dealt with the interaction of coatings and glues with the wood substrate, cell wall development, the effectiveness of wood preservatives, and the identification of natural inclusions in wood. The field of wood physics has had active projects in the permeability of wood, the mechanisms of fluid transport, and the mechanisms of electric charge transport. Current projects are underway in the mechanical behavior of fiber networks, fracture mechanics of wood, and the behavior of new structural designs which represent interests in the field of mechanics. In addition, there is a newly emerging field dealing with the properties of wood-based composite materials.

The laboratory facilities of the department include a well-equipped mechanics laboratory which has a range of mechanical testing machines, a well-equipped physics laboratory with a wide range of electronic instrumentation, complete wood processing facilities including a sawmill and

veneer mill, and an extensive foreign wood collection. In addition, the College has available a complete microscopy laboratory containing both scanning and transmission electron microscopes together with a wide variety of light microscopes and related equipment. Extensive equipment for chemical analysis and nuclear chemical techniques serve the College's research program.

Forest Engineering

TULLY, *Acting Chairman* (Structural Design, Hydrology, Soil Mechanics); BENDER (Geodesy, Remote Sensing); BROCK (Analytical and Interpretive Photogrammetry); LEE (Systems Analysis, Computer Science); PALMER (Industrial Engineering).

The Forest Engineering program is primarily concerned with engineering analysis and design in concert with other pertinent disciplines for the holistic development of the natural resources associated with the forest environment. The program objective is to support the discipline by producing graduates with sufficient understanding of the forest environment and its resources, of the methodologies of scientific research, and of the principles of engineering analysis or design to work with competence in resource-related research, engineering design and management.

Individually designed programs leading to the Master of Science and Doctor of Philosophy degrees are available. Undergraduate backgrounds required depend upon the student's needs and interests in his graduate study. The student may emphasize engineering measurements, analysis or design within the program's breadth of engineering concern for environmental influences and resource utilization. Successful programs of graduate study in Forest Engineering may be efficiently designed by students with Bachelor of Science degrees in engineering or in forestry, natural sciences, physics or mathematics.

Programs of emphasis on environmental engineering measurements may be designed in Remote Sensing, Photo Interpretation, Geodetic Engineering, Analytical Photogrammetry and Photogrammetric Systems. Programs emphasizing engineering analysis and design are available in Water Resource, Transportation, Harvesting and Site Engineering Systems. Included are the monitoring, measurement and evaluation of physical parameters affecting water, soil, timber, vegetation and wildlife.

Support for the Forest Engineering Graduate Program is both internal and external. The internal support includes modern laboratory and instrumentation facilities in the Engineering Schools at both the College and Syracuse University. Exceptional departmental support exists for programs in environmental engineering measurements in the form of photogrammetric laboratories and the extensive forest properties owned by the College at which research may be conducted.

External support for the program comes from several active sources, including industrial, commercial and governmental. Over the past two decades, close cooperation has developed special study and research opportunities with these sources.

SCHOOL OF ENVIRONMENTAL AND RESOURCE MANAGEMENT

CHARLES C. LARSON, *Dean* (International Forestry, Resource Policy)

Department of Managerial and Social Sciences

ARMSTRONG, *Chairman* (Industry Economics, Resource and Market Analysis); BENNETT (Economic Theory, Economic Thought in Forestry); CANHAM (Regional Economics); CHRISTIANSEN (Forest Production Economics, Economic Systems Analysis); DUERR (Managerial Economics, Resource and Market Analysis); ECHELBERGER, MOELLER, SHAFER (Forest Recreation Research); GARTHE (International Forestry in Economics); HANSELMAN (Educational Communications); KOTEN (Management, Systems Analysis); MORRISON (Sociology of Outdoor Recreation); PETRICEKS (Macroeconomics, International Forestry Economics); WILLIAMS (Forest Taxation).

Department of Policy and Program Affairs

GETTY, *Chairman* (Forest Policy, Administration, Management); GRAVES (Resources Policy, Planning, Management); HENNIGAN (Resources Policy, Management); HORN (Law, Business Management).

Department of Silviculture and Forest Influences

JOHNSON, *Chairman* (Silviculture); BERGLUND (Silvics); BLACK (Watershed Management); CRAUL (Forest Soil Science); ESCHNER (Forest Influences); HERRINGTON (Meteorology); LEA (Director, Summer Field Session, Silviculture); LEAF (Forest Soil Science); MINCKLER (Hardwood Silviculture); RICHARDS (Silviculture, Environmental Science); WESTFALL (Physical-genetics, Tree Improvement).

Biometry and Operations Research Section

CUNIA (Operations Research, Statistics Mensuration); KASILE (Experimental Design, Biometrics, Statistics); STITELER (Biometry, Experimental Design, Computer Analysis).

Graduate study in the School of Environmental and Resource Management is offered in the broad fields of forestry economics; forest management, including biometry and operations research; and silviculture, including forest influences.

Forestry Economics Program

Graduate study emphasizing the economic aspects of forestry is offered by the School in programs leading to Master and Ph.D. degrees. The Master's programs are designed to meet the needs of the graduate in forestry or forest products. They also serve the graduate in liberal arts, engineering, or business whose interests point toward the economics of forest resource management. The aim is primarily to broaden the student's understanding of the content of forestry economics.

The Ph.D. program is for those who wish to make a career as professional forestry economists in research institutions, in the academic world, or in business or government. The goals are depth of understanding and familiarity with economic tools contributory to making competent decisions in resource economics, management, and policy. Requirements are in general the same as those observed in economics departments of leading universities, except that the student completes specified work in the economics of forestry.

Whatever the program, the basic purpose is to help the student acquire the tools and facility for disciplined, logical, critical, and constructive thinking and for clear expression in this field.

Instruction at the College of Environmental Science and Forestry is supplemented by the wide range of courses available in the Maxwell Graduate School of Citizenship and Public Affairs, the School of Management, and other units of Syracuse University. Individual programs may include supporting courses in general economics, mathematics and statistics, operations research, business, international affairs, and other social sciences and related fields. The substantial library resources, computer facilities, and other resources of Syracuse University also supplement those of the College.

Graduate research in forestry economics within the School covers a broad spectrum. Examples of topics recently treated are: application of economic systems and operations research in timber management and in the manufacture and marketing of forest products; forestry investments in the face of uncertainty; economic models for public forestry decisionmaking; history of economic thought in forestry; the financing of public recreational improvements; and forestry investment criteria in developing nations.

Forest Management Program

Graduate study in forest management offers wide opportunity for either specialization or breadth in advanced study. The faculty foster a spirit of individual initiative and free inquiry into all aspects of managerial concerns. Joint programs are common, aiming at strength and balance with relevant knowledge offered in other departments and disciplines. Graduates from various fields of study are encouraged to apply. Two areas of concentration are outlined below as exemplary of programs which permit the student to prepare himself in depth, while encouraging flexibility and broader understanding.

A management program prepares graduates for the field of administration or management in a public agency or a business concerned with natural resources or environmental quality at the executive, planning, budgeting, programming, operating, or leadership levels. The wide choices in other departments of the College and in the many units of Syracuse University, including the renowned Maxwell Graduate School of Citizenship and Public Affairs and the School of Management, are used to supplement offerings by forest management faculty. This enables the student to earn a Master's degree which is the forestry or natural resources equivalent of a Master of Business Administration or Master of Public Administration degree.

The Ph.D. program is scientifically oriented and strongly supported by courses in the behavioral sciences to develop the talents needed in top executive leadership in the rapidly developing fields of man-resources relationships, environmental quality, and management sciences. Interested graduates from business and other colleges qualify for the Master and Ph.D. programs by including sufficient forestry in their graduate program to provide a natural resources background.

Forest recreation is an area of graduate study and research within the management program which allows the student to pursue specialized inquiry into several aspects of outdoor recreation or to prepare for a career in teaching or government. Elective support may be drawn from courses within the College including those in landscape architecture, economics, silviculture, and zoology. Syracuse University courses in sociology, psychology, philosophy, journalism, education, and related fields offer strong support for the student preparing seriously for employment in the general field of outdoor recreation. Of special significance is the Recreation Research Branch of the Northeastern Forest Experiment Station of the U. S. Forest Service located at the College of Environmental Science and Forestry. Its Director and professional recreation researchers in residence at the College serve as adjunct faculty.

Both Master and Ph.D. candidates are presently matriculated in this program. Interested graduates with a Bachelor of Science degree in rural sociology, psychology, urban planning, political science, business or public administration qualify for this program by including sufficient forestry study in their graduate program to provide a natural resources background.

Biometry and Operations Research Program

Graduate study in forest biometrics is concerned with applications of various mathematical concepts and techniques to forestry and to forest related activities, that concern forests, associated plants and animals, forest products, and competing uses of forest land, or formerly forested land.

Graduate programs leading to Master and Doctorate degrees are worked out to meet the interests of each student. Facilities include two computer centers with an IBM 370 and CDC 3200 system and a new statistics laboratory with modern equipment. These programs may be strengthened by supplementary courses taken at Syracuse University, especially in the School of Management and in the Department of Mathematics, and by consultation with associated faculty.

Programs are available in two broad categories: applications of biometry to forest science and adapting the principles of operations research to practical management problems. It is also possible to have forest biometrics or operations research or both as a co-major with another program at the College.

Applications of forest biometrics include designing sample surveys and experiments, analyzing resultant data, and interpreting (in a statistical sense) the results obtained. Forest science, as used in this context, includes all aspects of forests and forestry that have rigorous scientific basis.



Operations research is concerned with applications of optimization techniques such as mathematical programming, simulation, network analysis to many forest management problems in the private and government forest enterprises. Areas of application are very wide and may include such problems as choice of best alternative in land use, optimization of timber production in given forest areas, optimum planning for logging operations, industrial engineering problems in woodlands or mill operations, and so on.

The graduate faculty in forest biometrics also serves as consultants to faculty and students from all the Schools of the College with respect to their applications of statistics, biometrics, and operations research.

There is a very strong demand for biometricians, statisticians, and operations research analysts in almost every field of application, and this demand is likely to continue. Funded positions remain unfilled for want of qualified candidates. The need in relation to forestry is particularly crucial in view of the present need for dependable information about our forests and their role with respect to the current popular concern with environment and pollution.

Silviculture Program

Concern for the forest ecosystem provides a major focus for the work in this field. Translation of these concerns to broader questions of environmental quality is given attention. Well-equipped laboratories, specialized equipment, and greenhouse facilities are available to graduate students.

Graduate study in all aspects of silviculture and its supporting sciences is available. Emphasis can be placed on fundamental biological relationships or on applications of these relationships in the forest environment. Programs are coordinated with other areas of specialization through co-operation between the Department of Silviculture and Forest Influences, other departments of the College, Syracuse University, and the U. S. Forest Service Research Unit. A major strength is the close association of scientists

representing a broad spectrum of specialists, stimulating intra- and interdisciplinary cooperation.

Graduate emphasis may be directed to silvics, silviculture, forest stand development, forest influences and watershed management, forest tree genetics and tree improvement, forest meteorology and climatology, forest soil physics and forest soil fertility-nutrition, and site relations.

Extensive College forests of nearly 25,000 acres include most forest types of the Northeast, as well as plantations, seed orchards, and a tree nursery, all of which offer exceptional opportunities for field study under a wide variety of environments. Major field installations include long-term northern hardwood stand improvement studies, the oldest continuously studied forest fertilization trials in the United States, and two large micro-climatic tower complexes with associated automated data acquisition systems and instrumentation.



SCHOOL OF LANDSCAPE ARCHITECTURE

BRADFORD G. SEARS, *Dean* (Natural Area Studies)

EARLE (Art, History of Environmental Development); **REIMANN** (Methods and Philosophy of Design); **CURRY** (Urban Analysis and Design); **LEWIS** (Urban and Regional Planning, Gaming Simulation).

There has always been a need and a desire for man to adjust to his physical environment, or to modify it in order to meet his requirements for shelter, sustenance, and communication. We have reached the point in the latter half of the 20th century where economic and technological sophistication enables man to completely control the physical environment. It is within the balance between man and nature, and the manipulation of land as it relates to man's use, that the role of the landscape architect lies. The pro-

fessional landscape architect is concerned with the quality of the condition and form of the physical/cultural landscape. Because of this concern, he may work at any scale, from small site design projects with their related designed amenities, to the orchestration of regional, national, or international projects which attempt to develop policy for qualitative use of land.

Landscape architecture is about land and people. The very dynamics of this relationship has lead to a profession which is always changing to keep abreast of man's needs.

The MLA degree program offers the opportunity to study advanced concepts and methods in landscape architecture. It is a 48-credit hour curriculum of required and elected courses which is normally completed in two years. The curriculum has three aspects: a sequence of required *core* courses; a series of elected courses; and a terminal study.

Studio courses, seminars, and courses in methods and topics for environmental research form the required core sequence. The emphasis in these courses is on identification and definition of environmental problems, development of strategies for their solution, and utilization of sophisticated methods and techniques in their resolution.

Complementary to the required courses, the degree candidate takes a series of elective courses which he normally chooses from the School, the College of Environmental Science and Forestry, or Syracuse University. Each student orients his choice of elected courses to his personal educational objectives. He may wish, for example, to specialize in one or generalize in the many disciplines related to the needs of the professional landscape architect. Upon the approval of the faculty, a student also has the opportunity to take a part of his elected course work in self-described independent study.

Each MLA degree candidate completes his degree requirements by preparing a well-documented terminal study and satisfactorily defending his work in an oral examination. The terminal study is normally completed during the fourth semester of residence.

Research at the School, both sponsored and independent, has two major thrusts. The first is applied research. Here emphasis is to develop greater sophistication in contemporary methods and techniques used to solve real environmental problems. The second is original research, where the emphasis is to develop new data, criteria, or methods which can be used in solution strategies for environmental problems.

The College library and the several libraries on the Syracuse University campus offer excellent in-depth reference material to support study programs. Facilities at the School are extensive. They include adequate studio and office space as well as reproduction, model making, photographic, and audio-visual equipment. The College maintains a computer center which is used primarily for instruction and is available for individual use by graduate students. The College also has a fully equipped video tape recording (VTR) studio and photogrammetric labs.

The School is unique in its location within the College of Environmental Science and Forestry. This situation provides the MLA candidate with the opportunity to draw upon information and knowledge in ecology,

natural sciences, resource management, forestry, and many other related environmental concerns. In addition, the relationship with Syracuse University provides the School with a wide-ranging human and physical resource base.

The Syracuse area has the largest concentration of landscape architectural firms in the State, outside of New York City. With a metropolitan population of nearly 500,000, the city has many opportunities for urban-oriented study. Also, the city's central location in upstate New York provides easy access to a rich variety of public lands and recreation areas which are planned and administered by a diverse range of governmental agencies and private owners.

Any student with a Bachelor's degree or the equivalent from a college or university of recognized standing is welcomed to apply for admission to the MLA degree program. Along with the general application requirements of the College, each applicant is encouraged to submit any examples of his work, such as academic reports, terminal projects, and portfolios of creative endeavors or design work.

INTERDEPARTMENTAL AND MAJOR INTERDISCIPLINARY PROGRAMS

Interdisciplinary graduate study programs at the College of Environmental Science and Forestry are both of an informal and formal nature.

Interdepartmental Programs

Informal programs are of long tradition and permit students to select thesis topics and develop programs from a broad spectrum of professional and science topics in forestry, forest products, the physical and biological sciences, engineering, and landscape architecture involving the supporting resources of several departments. These informal interdisciplinary programs are achieved readily through flexible degree requirements and the assignment of thesis committee members representing the key supporting areas.

Some of the major areas of informal interdepartmental programs are listed below. Other programs suggestive of the range of topics available to students in the informal interdisciplinary approach are subjects involving the biological sciences and biochemistry; paper science, engineering, and plastics; wood products engineering, wood science, and polymer chemistry; silviculture and the botanical sciences; tree improvement and genetics; and wildlife biology and resource management. Though considerable breadth and flexibility are achieved in these informal interdisciplinary graduate study programs, students are still required to meet in full the degree requirements of their major department.

Forest Land Use and Regional Planning. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management and Landscape Architecture. See the statements of these Schools for further information as to subjects covered and courses available.

Forest Soils. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management; Biology, Chemistry,

and Ecology; and Environmental and Resource Engineering. See the departmental statements in these Schools for further information.

Chemical Ecology. Interdepartmental graduate programs involving the School of Biology, Chemistry and Ecology. See the departmental statements in this School for further information.

Forest Recreation. Interdepartmental graduate programs involving the Schools of Environmental and Resource Management and Landscape Architecture. See individual School statements for further information.

Plant Physiology — Biochemistry. Interdepartmental graduate programs involving the School of Biology, Chemistry and Ecology. See the departmental statements in this School for further information.

Approved Interdisciplinary Programs

Formal interdisciplinary programs leading to Master and Doctor of Philosophy degrees are available in the areas of *World Forestry*, *Water Resources*, and *Organic Materials Sciences*. These three programs are designed to permit greater supporting subject breadth and topic focus than is available in the departmentally based informal interdisciplinary programs. These formal interdisciplinary programs are described below:

World Forestry

Program Leader — CHARLES C. LARSON, Professor of World Forestry, Director of International Forestry, and Dean of the School of Environmental and Resource Management.

Graduate study and related research in world forestry is a College-wide activity supported by faculty representing the major areas of professional faculty specialization and broad backgrounds of foreign forestry experience. The nontechnical elements of the program are supported by a wide variety of course offerings in the Maxwell Graduate School of Citizenship and Public Affairs, the Department of Geography and other departments of Syracuse University. Opportunities for field training and research in tropical forestry and related fields are available to qualified participants in this program, under cooperative agreements maintained by the College with the University of the Andes, at Merida, Venezuela, and the Institute of Tropical Forestry of the U.S. Forest Service, at Río Piedras, Puerto Rico. The College also participates in the program of the Organization for Tropical Studies which provides opportunities for advanced study and research in tropical forestry and related fields for selected graduate students.

Graduate study in this field is aimed at supplementing and enriching the student's technical forestry knowledge and providing the broad background deemed necessary for effective service in foreign forestry. This includes service as forestry advisor, teacher and research specialist with national and international agencies, private business and industrial firms, philanthropic foundations and voluntary service organizations whose activities include the development and/or use of forest resources in other lands.

At the Master's level, program emphasis is on the attainment of general competence in foreign languages, cultural anthropology, world geography,

history, and international affairs, plus a broad understanding of the world forestry situation. While the candidate is urged to devote major effort to formal course work, a thesis is required to provide a creative experience in critical study and original thinking. Sufficient flexibility is maintained to enable the student to focus his studies on some aspect of world forestry either global, regional or national in scope.

At the doctoral level, program concentration is on a specialized discipline area such as forest botany, forestry economics, forest management, silviculture, or wood products engineering. Orientation to the world forestry field in this case is achieved in part through the selection of formal course work, and in part through providing an opportunity for the student to conduct his thesis research in residence abroad. Major program emphasis is placed on a thesis representing a significant contribution in original study in a world forestry problem area.

Water Resources

Program Leader — PETER E. BLACK, Associate Professor, Watershed Management.

The College is concerned broadly with biological and managerial relationships of forest resources, and the productive uses and benefits of forest products and services. The College has particular interests in the ecological and biological relationships having to do with the management and utilization of water resources; with problems of water quality, quantity, and availability as these are related to land use and development activities; and with the special problems of the forest industries which utilize water in manufacturing processes or produce by-products which affect water quality. The rehabilitation, protection and improvement of watersheds is an important corollary area of interest.

Graduate study programs in water resources may be arranged on an informal basis within several departments of the College to include the disciplines of forestry economics, forest management, forest engineering, silviculture, landscape architecture, forest zoology, forest entomology, forest chemistry, and paper science and often involve support from several Colleges of Syracuse University.

The formal Interdisciplinary Program in Water Resources was organized in 1968 to supplement departmental programs by providing a sound basis for graduate academic programs designed to emphasize the multidisciplinary aspects of water resources. This effort recognized that water relationships are important in almost every aspect of human concern and merit attention as integrative and central elements rather than accessories. The Water Resources Program makes available to graduate students pertinent resources of the College and of Syracuse University, and where appropriate, those of other units of the State University.

The program is primarily for doctoral students. It is not structured in terms of required courses or content. Attention is given to the particular objectives of each student who enrolls in the program. Within the framework of the general graduate study requirements of the College, courses,



problems and seminars are selected to attain the specific objectives and special interests sought by the student. The academic competence required is demanding. The programs arranged are broadly integrative rather than concentrated in a discipline. Critical review of the program proposed for each student is made by an assigned program committee to ensure that institutional standards are maintained and program objectives are met.

A major professor is assigned by the Program Leader to accept primary responsibility for the program of each student. Two additional faculty members in areas of expected academic or research emphasis are also selected. These three faculty members constitute the academic program committee for the student. The student is required to submit a formal report to the program committee consisting of a detailed work plan describing and defending his academic and research objectives and a schedule of courses and other elements of his contemplated study. This report is reviewed by the program committee, and is made a part of his permanent file. It is reviewed and updated at the beginning of each semester. The program committee will also serve as the thesis committee.

Organic Materials Science

Program Leader — KENNETH J. SMITH, JR., *Professor*, Department of Chemistry, and Assistant Director, State University Polymer Research Center.

Organic Materials Science is that segment of the natural sciences that deals with structure-property relationships in organic materials. The College has long been involved in various aspects of Organic Materials Science

through programs in the sciences of paper, polymers and wood. An understanding of the behavior of materials in general has developed rapidly in recent years and it is now clear that many of the fundamental concepts of material properties are applicable to both natural and synthetic polymers. This thinking has led to establishment of the new interdisciplinary program in Organic Materials Science. This program involves the Departments of Chemistry, Paper Science and Engineering, and Wood Products Engineering, the Empire State Research Institute, the Cellulose Research Institute, and the State University Polymer Research Center.

Organic Materials Science strives to instill in the student a broader perspective than is normally achieved in standard academic programs. This is accomplished by uniting the student's immediate research interests to larger goals involving several disciplines. In this manner a generalization of interest is acquired without sacrificing scientific rigor and depth of knowledge in more restrictive areas. Materials of current research activity include films, fibers, elastomers, composites, antithrombogenic materials, membranes, polyelectrolytes, polysalts, fiber assemblies, wood, paper, and wood-polymer systems, and involve studies in thermodynamics, statistical mechanics, chain conformations, crystallization, crystal morphology, X-ray, light scattering, polymerization, polymer reactions, wood and paper physics, elasticity, contractility, heat and mass transport, and paper properties. See also the sections of the participating departments and institutes.

Although graduate programs in Organic Materials Science are available at both the master and the doctoral level, it is expected that most students work for the doctoral degree. Programs consist of course work and research. Course work requirement is tailored to build upon the individual student's undergraduate background and experience. Entering students are expected to have a Bachelor's degree in chemistry, physics, engineering, polymer science, wood and paper science. The course work portion of the Organic Materials Science program will be directed toward background preparation in solid state and polymer science. Near the end of the student's course work program he will be exposed to the modern concepts of the structure-property relationships that are of importance in organic materials. Research topics will be selected to permit the student to explore in depth an aspect of organic materials in which he has a particular interest.

Students registering in the Organic Materials Science program satisfy all college-wide requirements for advanced degrees. Each student will be assigned a major professor and a faculty committee who will help him plan his course work program and who will serve as consultants on his research project. Courses will be selected from those offered, both at the College of Environmental Science and Forestry and the Colleges of Engineering and Liberal Arts at Syracuse University. The research work will be carried out in College of Environmental Science and Forestry laboratories which are particularly well equipped for materials science studies.

CONTINUING EDUCATION



CONTINUING EDUCATION

The philosophy that education is a lifelong pursuit is an ancient one, and was written into the law creating the College. This concept is doubly important to the sciences and professions in this technological age, when new knowledge is bursting in all directions. Hence, the College has, over the years, succeeded in communicating knowledge on forest resources management, utilization and conservation to a wide variety of off-campus publics. The entire College faculty has contributed to these programs. Now, to reinforce this commitment, the College is establishing a School of Continuing Education upon which to base expanded educational opportunities.

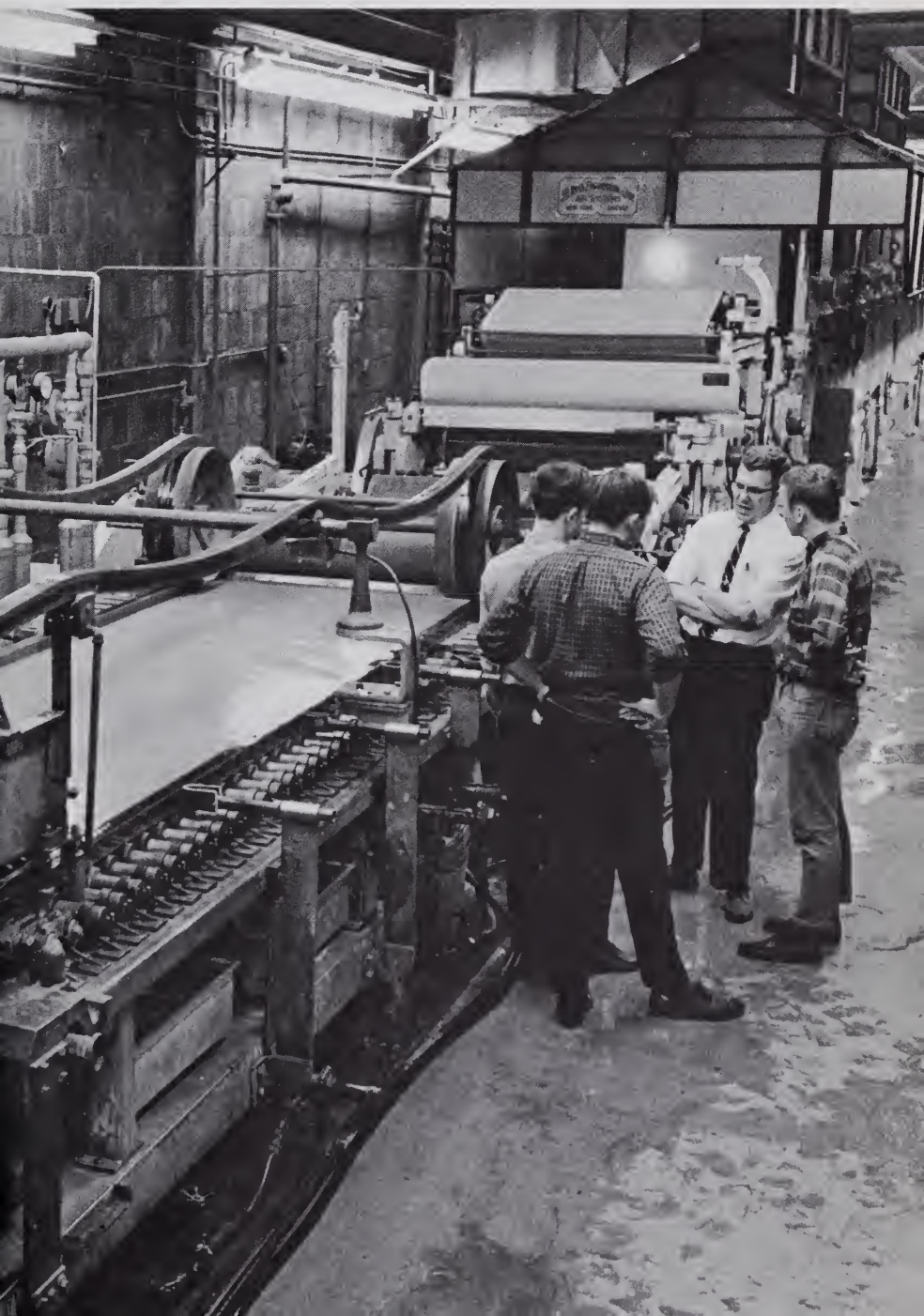
Conferences, symposia, seminars and short courses on various aspects of forestry and the related sciences are conducted at both the basic and applied levels. Audiences include forest owners, managers, and operators; wood engineers and forest industries personnel; academic and scientific groups, conservation and recreation personnel from local and other public and private planning groups and citizen-action committees. Upon request, special continuing education programs can be designed to meet the specific needs of professional organizations, agencies and industry. Credit or non-credit courses, at campus or off-campus sites can be arranged.

The College recognizes that the informational needs of New York's citizens are undergoing change. Some of the factors now affecting the continuing education program are: the abandonment of farmland and the increasing urban character of the population, the changing pattern of ownership of forestland, the rise in level of education and sophistication in a more affluent society, the dynamics of technological change, and the increase in leisure time, greater mobility in travel, and outdoor recreation.

Expansion of "in-service" training courses, establishment of "environmental learning centers" on College forest properties, and production of media materials for public information and education are examples of activities directed towards updating and upgrading professional clients and broadening the public's awareness and appreciation of New York's forestlands and other natural resources.

For information on specific continuing education projects, inquiries should be sent to: Dean, Public Service, Continuing Education and Educational Communications, State University College of Environmental Science and Forestry, Syracuse, N. Y. 13210.

COURSE OFFERINGS



COURSE OFFERINGS

The academic resources of three institutions — the State University College of Environmental Science and Forestry, Syracuse University, and the State University Upstate Medical Center — are available to undergraduates and graduate students in developing their study programs at the College.

In addition to the many professional and basic science courses offered by the College, a wide range of offerings are taken either as required courses or are available as electives at adjacent Syracuse University. The required courses are in certain subject areas of chemistry, engineering, physics, mathematics, geology, English, business law, personnel relations, and public address. The elective courses include most academic offerings of Syracuse University and representative subject areas are the humanities, social sciences, life sciences, physical sciences, engineering, mathematics, and the arts. Descriptions of Syracuse University courses are not included in the following College of Environmental Science and Forestry courses.

In graduate programs at the College, Syracuse University courses are used extensively in the fields of mathematics, physics, chemistry, biology, engineering, economics, business, and citizenship. The State University Upstate Medical Center has courses available for graduate programs in the areas of anatomy, biochemistry, cytology, microbiology, and physiology.

DESCRIPTION OF COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSES

The courses offered by the College are grouped by general subject areas, and the number of credit hours appears after the course title. A credit hour means one recitation (or lecture) hour per week. Three laboratory hours are equivalent to one lecture hour.

Course Numbering System (Effective September, 1968)

I. Code Levels:

- 000-099 Noncredit courses
- 100-199 Freshman courses
- 200-299 Sophomore courses
- 300-499 Junior & senior courses
- 500-599 Junior & senior courses which may be accepted for graduate credit at the discretion of the graduate student's major advisor, usually with the requirement of additional work to be performed.
- 600-699 Graduate courses designed primarily for the beginning graduate students but available for credit to all graduates.
- 700-899 Advanced graduate courses designed primarily for second and third year graduates and beyond, but available to all graduates.
- 900-999 Special graduate courses available only to doctoral students.

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SYRACUSE CAMPUS COURSES

APPLIED MATHEMATICS

360. INTRODUCTION TO COMPUTER PROGRAMMING *3 credit hours*

The basic course in computer use offered by the College. It is intended to provide the student with the skill and understanding needed to utilize digital computer languages or problem solving. The course will cover instruction in Fortran IV, and an Assembly language plus some discussion of PL/1, Algol, APL, and use of software operating systems. This course or a demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall & Spring. Mr. C. N. Lee & Staff.

560. INFORMATION PROCESSING FUNDAMENTALS *3 credit hours*

Three hours of lecture per week. The course presents problem solving and ana-

lytical structures, and practice in their application by use of a digital computer. Selected portions from the two general processing categories of numerical analysis and information systems are presented for discussion and study. The purpose is to develop an awareness with some understanding and proficiency in automated problem-solving systems. Fall. Mr. C. N. Lee & Staff.

Prerequisites: Integral calculus and proficiency in computer programming.

571. INTRODUCTION TO STATISTICAL ANALYSIS *3 credit hours*

Two hours lecture and three hours lab. Elementary probability, sampling distributions, statistical estimation, hypothesis testing, inferences regarding means and variances, simple regression and correlation, and determination of sample size. Fall & Spring. Mr. Kasile.

Prerequisite: Junior or senior standing.

591. INTRODUCTION TO
PROBABILITY AND
STATISTICS

3 credit hours

Two hours lecture, three hours lab. Bases for application of standards of accuracy and statistical methods in forest science and technology; elementary probability in relation to the distribution of random errors and the measurement and control of these errors. Fall. Staff.

Prerequisites: Two semesters of calculus.

593. INTRODUCTION TO
ANALYSIS OF VARIANCE

3 credit hours

Two hours of lecture, three hours lab. One and two-way analysis of variance, multiple comparisons, subsamples, unequal sample size, tests of hypotheses, statistical estimation, determination of sample size. Fall. Mr. Kasile.

Prerequisites: AM 571 or AM 591, or equivalent.

595. INTRODUCTION TO
SAMPLING TECHNIQUES

3 credit hours

Two hours lecture, three hours lab. Introduction to the scientific basis of sampling; selecting an appropriate sampling unit; choosing an efficient design; calculating sampling error; determining a sample size to meet stated objectives. Spring. Staff.

Prerequisites: AM 571 or equivalent.

719. STATISTICAL ANALYSIS

3 credit hours

Two hours lecture, three hours lab. A treatment of statistical inference, including paired design, group design, linear regression and correlation, one way analysis of variance, and some applications of chi-square. Calculation of statistics, tests of hypotheses, and proper interpretation of calculated statistics. Fall. Staff.

720. ANALYSIS OF VARIANCE

4 credit hours

Three hours of lecture and recitation, three hours of lab. Multiway classifications in the analysis of variance, with emphasis on the development of models, including randomized blocks, latin squares,

split plots, and factorial designs with fixed effects, random effects, and mixed effects; multiple and partial regression and correlation (including curvilinear), using matrix methods; analysis of covariance, higher order contingency tables, distribution free methods, and sequential testing. Spring. Mr. Kasile.

Prerequisite: Graduate standing and an introductory course in statistics covering material through the one-way analysis of variance.

760. COMPUTER APPLICATIONS

3 credit hours

A course presenting some discussion and practice in the application of computers to the solution of complex large-scale problems. A study of simulation techniques provides the opportunity to apply a computer to the solution of problems normally considered outside the realm of classroom experience. A study of some programming systems permits the opportunity to see how computers are used to solve their own problems of efficiency concerned with time, space, and reliability. Spring. Mr. C. N. Lee.

Prerequisites: AM 560 and AM 591 or the equivalents.

BIOLOGY (FOREST BIOLOGY)*

301. FIELD BIOLOGY

1 credit hour

Five days of field work. A study of biotic groups in terrestrial and aquatic environment; the structure and function of natural communities; the relationship of biota to physical features of the environment. Summer Session in Field Forestry. Mr. VanDruff.

Prerequisite: A year course in biology or equivalent.

320. GENERAL ECOLOGY

3 credit hours

Two hours lecture, three hours of field trips during the first half of the semester. Three hours lecture during the second half of the semester. Introduction to ecosystem ecology stressing the dynamic interrelationships of plant and animal communities with their environments,

*See also listings for Forest Botany, Forest Entomology and Forest Zoology.

ecological factors, energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, biogeography, and representative ecosystems. The ecological impact of man is reviewed. Fall. Mr. Alexander.

Prerequisite: A year course in biology or equivalent.

330. PRINCIPLES OF GENERAL PHYSIOLOGY

3 credit hours

Three hours of lectures. Introduction to the dynamics of living systems with emphasis on the universality of the biological world. Fall. Mr. Brezner.

Prerequisite: One semester of organic chemistry.

497. UNDERGRADUATE SEMINAR

1 credit hour

Literature surveys and seminars on topics of biological interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Spring and Fall. Staff.

498. RESEARCH PROBLEM IN BIOLOGY

1-3 credit hours

Independent research in topics in Forest Biology for the superior undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions, and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

515. ADVANCED LIMNOLOGY

4 credit hours

Note: SUNY, Albany No. BIO 516

Eight weeks, two full days/week. Comprehensive analysis of primary and secondary producers in a selected series of Adirondack lakes and streams. Lecture discussion sessions to serve to direct individual student projects detailing the flow of energy and circulation of matter in a variety of mountain habitats. Summer Session I & II, Cranberry Lake Biological Station. Mr. McNaught, SUNYA.

Prerequisite: Bio 202, 12 hours of biology.

521. ECOLOGY OF FRESHWATERS

2 credit hours

Note: SUNY, Albany No. BIO 421

Two full days/week for four weeks. Experimental and observational studies of environmental and biotic interactions, influencing productivity of freshwaters. Basic concepts at the organismic, population, and community level. Summer Session I, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: A course in ecology.

540. CHEMICAL ECOLOGY

3 credit hours

Two hours of lecture and one hour of discussion. A treatment of biological phenomena incorporating elements of ecology, physiology, and chemistry as a basis for development and behavior and survival. Emphasis is on intra- and interspecific relationships involving chemical messengers at the organismal population and community levels. Spring. Mr. Simeone.

Prerequisites: Organic chemistry, general ecology, general physiology.

571. FUNDAMENTALS OF GENETICS

3 credit hours

Three hours of lecture. A general course in genetics covering the inheritance and analysis of Mendelian and quantitative traits; the chemical nature, function, and activity of the gene in cells and development; population genetics, and evolution; and the applications of genetics in animal and plant breeding. Fall. Mr. Valentine.

Prerequisites: F Bot 100, F Zool 100, or equivalent courses.

572. FUNDAMENTALS OF GENETICS LABORATORY

1 credit hour

Breeding experiments with plants and animals demonstrate basic principles of inheritance and changes in populations caused by major forces in evolution or by breeding procedures. Methods and procedures for utilizing bacteria, fungi and higher plants and animals in genetic experiments are included. Fall. Mr. Valentine.

Corequisite: F Biol 571 or equivalent course.

575. EVOLUTIONARY GENETICS

3 credit hours

Note: Syracuse University No. Bio 545

Three hours of lecture. Principles of evolution and the role of factors causing population changes, such as selection, breeding system, mutation, population size and structure, migration, and genetic drift are discussed. Theoretical population genetics models and experimental population studies are related to evolutionary theory and studies of natural populations. Species formation and the evolution of isolating mechanisms are considered. Spring (even calendar years). Mr. Valentine and Mr. Drugar.

Prerequisite: F Biol 571, or permission of the instructor.

576. LABORATORY IN EVOLUTIONARY GENETICS

1 credit hour

Note: Syracuse University No. BIO 546

Three hours of laboratory. Techniques and procedures for population studies and their application in experimental population genetics and in the analyses of natural populations. Spring (even calendar years). Mr. Valentine and Mr. Drugar.

Corequisite: F Biol 575.

670. CYTOGENETICS

3 credit hours

Two hours of lecture and one hour of seminar and discussion. Structure and behavior of chromosomes in animals and plants are considered. The effects of chromosomal aberrations and abnormal chromosome numbers on somatic and germ cell divisions, on the physiology and development of organisms with emphasis on human diseases, and on populations including structure, speciation and evolution are discussed. Lecture demonstrations include tissue culture and cell hybridization methods for karyotype analyses and somatic cell genetics. Spring (odd calendar years). Messrs. Lanier, Valentine and Neu.

Prerequisite: F Biol 571 or permission of the instructors.

720. PHYSIOLOGICAL ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 519

Two full days per week for four weeks. Studies of selected plant and animal adaptations to both natural and modified habitats. A physiological approach to understanding the unusual plasticity of plant and animal systems to environmental changes. Summer Session II, Cranberry Lake Biological Station.

721. POPULATION DYNAMICS

2 credit hours

Note: SUNY, Albany No. BIO 518

Two full days per week for four weeks. Interrelationships of biotic and environmental factors that control population responses and interactions. Summer Session II, Cranberry Lake Biological Station.

722. BIOCLIMATOLOGY

2 credit hours

Note: SUNY, Albany No. ATM 513

Two full days/week, for four weeks. Principles of climatology and meteorology as they relate to studies of the biosphere. Emphasis is upon ecologic problems and microclimatic techniques related to forestry, agriculture, and industry. Summer Session II, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: Consent of instructor.

785. HISTOCHEMICAL TECHNIQUES

3 credit hours

One lecture and two labs. The techniques of the microtomecryostat, freeze-drying, and freeze substitution, histochemical stains, and autoradiography in the elucidation of the constitution of cells and tissues. Spring (even calendar years). Mr. Pepper.

Prerequisites: Microtechnique and organic chemistry.

835. MEMBRANES AND BIOLOGICAL TRANSPORT

3 credit hours

Two hours of lecture and one hour of discussion. Composition, structure, and physical properties of membranes. Membrane functions including transport, bioelectricity, and cell compartmentalization. Specific transport processes in biological

systems. Fall (alternate years). Mr. Schaedle.

Prerequisites: One semester of biochemistry and an advanced physiology course, or permission of the instructor.

997. BIOLOGY SEMINAR

1 credit hour

One hour of lecture-discussion per week. The course emphasizes current concepts and developments in biology. Fall and/or Spring. Staff.

BOTANY (FOREST BOTANY AND PATHOLOGY)*

100. GENERAL BOTANY

4 credit hours

Prerequisite to all other courses in Botany. Two hours of lecture and four hours of lecture-laboratory in the Auto-tutorial Learning Center. An introduction to plant biology with special emphasis on the structure and function of the green plant. Fall. Mr. Geis.

210. DENDROLOGY I

2 credit hours

One hour lecture and one three-hour laboratory/field trip each week. Field study, identification, taxonomy, and elementary silvics of important forest trees of North America. Fall. Mr. Ketchledge.

310. CLASSIFICATION OF THE PLANT KINGDOM

3 credit hours

Two hours of lecture and three hours of lab. Introductory study of the plant kingdom with emphasis on the angiosperms. Spring. Mrs. Wang and Staff.

330. PLANT PHYSIOLOGY

2 credit hours

Two hours of lectures. Descriptive aspects of the fundamental activities of plants. Subjects to be covered include cell structure, water and mineral metabolism, organic nutrition and a brief introduction to biological control mechanisms. Will not satisfy the plant physiology requirement of botany majors. Fall. Mr. Schaedle.

Prerequisite: F Bot 100 or equivalent.

*See also listings for Forest Biology.

360. FOREST AND SHADE TREE PATHOLOGY

3 credit hours

Two hours of lecture and three hours of auto-tutorial laboratory. Major diseases of forest, shade, and ornamental trees and deterioration of forest products will be discussed with emphasis on disease identification, principles of disease development, effects of disease on the host, and practical control measures. Spring. Mr. Silverborg and Mr. Manion.

410. DENDROLOGY II

1 credit hour

One three-hour field trip/laboratory each week. A continuation of DENDROLOGY I emphasizing trees and shrubs ecologically important in the central New York region and economically important in North America. Fall. Mr. Ketchledge.

510. MYCOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Fundamentals of the morphology, taxonomy, cytology, life histories and ecology of fungi. Laboratory experience in culturing and identification of fungi. Fall. Mr. Griffin.

512. PHYCOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 507 Cranberry Lake Biological Station. Session II, every second or third summer. Two full days per week for four weeks. Study of the characteristic algae of selected Adirondack lakes and waters. SUNY Albany Staff.

Prerequisites: 15 hours of biology including general ecology and a course in the plant kingdom.

515. SYSTEMATIC BOTANY

3 credit hours

Two hours of lecture, three hours of laboratory. Identification, nomenclature and classification of flowering plants with special emphasis on local flora and on developing the ability to classify the plants of any region. Fall.

Prerequisite: F Bot 310 or permission of the instructor.

517. ADIRONDACK FLORA

1-2 credit hours

Note: SUNY, Albany No. BIO 517

One day a week for four/eight weeks. Cranberry Lake Biological Station. Field study of the summer flora of the Adirondack Mountains. Sessions I and/or II. Mr. Baum.

Prerequisite: An elementary course in systematic botany.

522. ECOLOGY OF FOREST COMMUNITIES

2 credit hours

Note: SUNY, Albany No. BIO 422

Cranberry Biological Station. Session II. Two full days per week for four weeks. Study of the structural and functional characteristics of selected Adirondack forest ecosystems; techniques of vegetational and environmental analysis. Special requirement: students must be prepared to go on two overnight camping trips to an isolated study area. Mr. Ketchledge.

Prerequisites: At least one semester of general ecology plus 15 hours of other biological sciences.

525. FOREST ECOLOGY

3 credit hours

Two hours of lecture/discussion; one laboratory/field trip; one weekend field trip. An advanced course stressing current research in forest dynamics, vegetational development, ecological methods, and phytosociology. Spring. Mr. Geis.

Prerequisites: F Bot 210; F Biol 320 or Silvi 521.

527. BRYOECOLOGY

2 credit hours

Two full days a week for four weeks. Field and laboratory work at the Biology Station. Study of the bryoflora of the major ecosystems of the Adirondack Mountain region. Summer Session I, Cranberry Lake Biology Station. Mr. Ketchledge.

Prerequisites: Survey of the plant kingdom; systematic botany; general ecology.

Special requirement: Students must be prepared to go on two overnight trips to isolated areas.

530. PLANT PHYSIOLOGY

2 credit hours

Two hours of lecture. Internal processes and conditions in higher plants with emphasis on physiological and biochemical concepts. For students majoring in the biological sciences. Spring. Mr. Wilcox.

Note: Botany majors electing this course for their concentration must also take F Bot 531.

531. PLANT PHYSIOLOGY LABORATORY

2 credit hours

Two lab sessions. Introduction to current methods and procedures of physiological research including nutrition, tissue culture, photosynthesis, respiration, and hormonal regulation of growth. Spring. Mr. Schaedle.

Prerequisites: F Bio 330, corequisite F Bot 530, or permission of the instructor. Advance tentative registration with the instructor is required.

561. PRINCIPLES OF FOREST PATHOLOGY

3 credit hours

Three hours of lecture discussion. Concepts and principles of tree diseases in relation to forest practice. Fall. Mr. Manion.

Prerequisite: F Bot 360 or consent of instructor.

562. WOOD DETERIORATION BY MICROORGANISMS

3 credit hours

Two hours of lecture, three hours of laboratory/field trip. Major types of fungus defects of wood and its products and principles of control. Special emphasis on chemistry of wood decay, wood durability, toxicants, lumber discolorations, heartrots, and decay in forest products. Fall. Mr. Silverborg.

Prerequisite: Organic chemistry, F Bot 360, or consent of instructor. Course offered in even calendar years.

585. PLANT ANATOMY

3 credit hours

Two hours of lecture, three hours of laboratory. An introductory course in plant anatomy designed to familiarize the student with the organization and

development of the primary and secondary plant body of higher plants. Spring. Mr. Tepper.

Prerequisite: F Bot 100.

630. FUNGUS PHYSIOLOGY

3 credit hours

Two hours of lecture, one hour of discussion. Principles of growth, reproduction and differentiation of the fungi emphasizing the role of the environment in controlling fungal processes. Spring (even years beginning in 1970). Mr. Griffin.

Prerequisites: Two semesters of physiology or biochemistry.

660. PHYTOPATHOLOGY

3 credit hours

Two hours of lecture discussions and three hours of Auto-Tutorial laboratory. Principles and concepts of plant pathology. Major diseases of ornamental plants, vegetable crops, fruit crops, field crops, and trees. This is an introductory plant pathology course for graduate students in all departments. Spring. Mr. Manion.

715. ADVANCED SYSTEMATIC BOTANY

2 or 3 credit hours

Lectures and laboratory. Field trips. Advanced study in the identification, nomenclature, and classification of flowering plants. Special emphasis on Gymnospermae, Compositae, and Gramineae. Fall.

Prerequisite: F Bot 515 or equivalent.

733. TECHNIQUES IN PLANT PHYSIOLOGY

2-4 credit hours

Comprehensive study of techniques essential for research in plant physiology. Students may choose the instructors they wish to work with, and should consult the instructors for further details. Fall of every year. May be repeated for credit in different specialties. Staff.

Prerequisites: F Bot 530 and 531 or an equivalent physiology course, biochemistry with laboratory, or consent of the instructor.

761. TOPICS IN PHYTOPATHOLOGY

3 credit hours

Two two-hour lecture-discussions. Discussions of specific phytopathological subjects. Topic selection is based on availability of expertise and will be announced in advance. Fall or Spring. Staff. This course may be repeated for credit in different specialties.

797. BOTANY SEMINAR

1 credit hour

Seminar discussions of subjects of interest and importance to the biology of plants. Fall and Spring. Staff.

798. RESEARCH IN FOREST BOTANY

Credit hours arranged according to nature of problem

Advanced study in research problems in forest pathology, wood deterioration, tree physiology, anatomy, mycology, ecology, taxonomy, and genetics. Type-written report required. Fall and Spring. Staff.

810. ADVANCED MYCOLOGY, HOMOBASIDIOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Fall. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in odd calendar years.

811. ADVANCED MYCOLOGY, HETEROBASIDIOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Spring. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in even calendar years.

812. ADVANCED MYCOLOGY, ASCOMYCETES

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Fall. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in even calendar years.

813. ADVANCED MYCOLOGY,
MYXOMYCETES,
PHYCOMYCETES, FUNGI
IMPERFECTI

3 credit hours

Review of selected literature as well as laboratory training in identification and research techniques. Spring. Mr. Lowe and Mrs. Wang.

Prerequisite: F Bot 510. Course offered in odd calendar years.

830. PHYSIOLOGY OF GROWTH
AND DEVELOPMENT

2 credit hours

Lecture. A study of the growth and development of plants and the physiological and biochemical processes that influence the development of form and structure in higher plants. Fall (even years). Mr. Wilcox.

Prerequisite: F Bot 530, 585, and organic chemistry or permission of instructor.

870. POPULATION GENETICS

3 credit hours

Three hours of lecture. The principles and theorems of population genetics based upon gene frequencies and genic effects in theoretical populations. Effects of inbreeding, selection, mutation, fitness, migration, and other factors are considered. Composition and changes in natural and laboratory populations are related to genetic theory. Spring (even numbered years). Mr. Valentine.

Prerequisites: F Biol 571, 572, one semester of calculus, AM 720, or permission of instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

CHEMISTRY

221. ORGANIC CHEMISTRY I

3 credit hours

Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with an emphasis on structure, nomenclature and fundamental reactivity and other important properties, uses, and characteristics. Fall. Mr. Silverstein and Staff.

Prerequisite: One year of freshman chemistry.

222. ORGANIC CHEMISTRY
LABORATORY I

1 credit hour

One three-hour laboratory period. Laboratory techniques in organic chemistry. Melting points, distillation, recrystallization, extraction, column and thin layer chromatography. Qualitative functional group analysis. Fall. Staff and laboratory assistants.

Prerequisite: One year of freshman chemistry.

223. ORGANIC CHEMISTRY II

3 credit hours

Two hours of lecture, one hour of recitation. A study in depth of the reactivity characteristics of the various classes of carbon compounds. The relation of chemical reactivity and physical properties to electronic and three dimensional characteristics of carbon compounds. Spring. Mr. LaLonde and Staff.

Prerequisites: One year of freshman chemistry and one semester of organic chemistry.

224. ORGANIC CHEMISTRY
LABORATORY II

1 credit hour

One three-hour laboratory period. Continuation of F Chem 222. Simple physical, quantitative and instrumental techniques applied to organic chemistry. Gas chromatography, polarimetry, kinetics. Introduction to synthesis. Spring. Staff and laboratory assistants.

Prerequisite: F Chem 222 or equivalent.

325. ORGANIC CHEMISTRY III

4 credit hours

Two hours of lecture, one six-hour laboratory period. Classical and recent literature synthesis of organic compounds, employing advanced techniques. Fall. Mr. LaLonde.

Prerequisite: Two semesters of elementary organic chemistry.

495. INTRODUCTION TO PROFESSIONAL CHEMISTRY

2 credit hours

Professional ethics and responsibilities of the practicing chemist. Employer-employee relations, legal and legislative relations. Alternate employment opportunities. Professional organizations. Safety in the laboratory. Organization and use of chemical literature. Selection of research topic and literature survey. Fall. Mr. Schuerch and Staff.

Prerequisite: Upper division status. Senior status preferred.

496. SPECIAL PROBLEMS IN CHEMISTRY

1-3 credit hours

An opportunity for a special problem, technique development, independent or unstructured study in an area related to the chemical profession. The work may be technical, professional, or interdisciplinary. Advisors outside this department may be solicited. A brief proposal must be presented for approval with specific arrangements outlined including faculty advisor and objectives of the study. Evidence of competence and appropriate effort is required for credit. A written report will usually be expected. Fall and Spring. Staff.

Prerequisite: Upper division status.

497. UNDERGRADUATE SEMINAR

1 credit hour

One hour per week. Literature surveys and seminars on topics of current research interest and recent advances in Chemistry. Spring. Staff.

498. INTRODUCTION TO RESEARCH

5 credit hours

Eighteen hours of laboratory per week, library search and report writing. Solution of a selected research problem using

special laboratory techniques. Typewritten report on data, procedures, results and conclusions. Spring. Staff.

520. NUCLEAR AND RADIATION CHEMISTRY

2 credit hours

The two one-hour lectures will cover the information required for the basic understanding of nuclear reactions, the types of radiation emitted, the instrumentation necessary to detect and measure this radiation, the principles of radioisotope tracer techniques, and radiation chemistry which is the effect of radiation on organic systems. Visits to the Cornell Reactor and the Nuclear Medicine Department of the Upstate Medical Center will be arranged. Spring. Mr. Meyer.

Prerequisites: Physical, organic, and inorganic chemistry or by permission of the instructor.

Note: This course can be taken independently of F Chem 521.

521. NUCLEAR CHEMICAL TECHNIQUES

1 credit hour

The laboratory will consist of one four-hour laboratory class every two weeks, with one hour to be made up at the student's discretion to accommodate counting periods which extend over several weeks. A short movie by the AEC each week will be required for the sixth hour. The laboratory will give each student the opportunity to use the individual counting instruments, gain experience in the handling and preparation of radioactive samples and the use of the 1000 Curie cobalt source in radiation chemistry. Spring. Mr. Meyer.

Prerequisite: Physical, organic and inorganic chemistry or permission of the instructor. Advance tentative registration is required.

Corequisite: F Chem 520.

530. BIOCHEMISTRY I

3 credit hours

Three hours of lecture. General biochemistry with emphasis on cellular constituents and metabolic reactions. The chemical, physical, and biological properties of amino acids, proteins, carbohydrates, and their intermediary metabolism will be discussed. The chemistry of enzymes, energy transfers, and biological

oxidations will also be covered. Fall. Mr. Sondheimer and Mr. Walton.

Prerequisite: One year of organic chemistry.

Pre- or corequisite: One year of physical chemistry.

531. BIOCHEMISTRY LABORATORY 2 credit hours

Six hours of laboratory. This course will stress techniques used in biochemical research. Techniques used include various types of chromatography, electrophoresis, and spectrophotometry, and methods involved in the isolation, purification, and assay of enzymes. Fall. Mr. Walton.

Prerequisite: One semester of quantitative analysis with laboratory.

532. BIOCHEMISTRY II 3 credit hours

Three hours of lecture. Topics discussed are: application of tracer techniques to biochemistry, the chemical and biochemical properties of lipids, theories on the origin of life, photosynthesis and the biosynthesis of steroids and terpenes, plant aromatics, amino acids, porphyrins, and other aspects of nitrogen metabolism. Spring. Mr. Sondheimer.

Prerequisites: F Chem 530 and its pre- and corequisites.

539. PRINCIPLES OF BIOLOGICAL CHEMISTRY 3 credit hours

Three hours of lecture. Principles of biochemistry with emphasis on their relationship to biology. Topics include basic metabolic pathways, structure and function of proteins, enzymes, and nucleic acids, energy relationships, and biochemical control mechanisms. Fall. Mr. Walton.

Prerequisite: A two-semester course in organic chemistry is desirable, but a one-semester course is acceptable. This course is not open to Chemistry majors.

540. CHEMICAL ECOLOGY This course is the same as F Biol 540. Refer to description on page 119.

550. INTRODUCTION TO POLYMER CHEMISTRY I 3 credit hours

Three hours of lecture. Mechanism and

kinetics of condensation and addition polymerization. Stereochemistry of macromolecules. Chain conformation and polymer solution theory. Methods of molecular weight determination. Fall. Mr. Smid.

Prerequisites: One year of organic and physical chemistry.

551. POLYMER TECHNIQUES 2 credit hours

One hour of lecture-discussion and three hours of laboratory; lab reports. Techniques of polymer preparation: free radical solution and emulsion polymerization, copolymerization. Molecular weight determination by light scattering, osmometry, viscosity, ultracentrifugation. Structure characterization by X-ray diffraction, electron microscopy, nuclear magnetic resonance, optical rotatory dispersion, polarized microscopy, stress-strain and swelling equilibrium. Fall. Mr. Sarko.

Prerequisites: One year of organic and one year of physical chemistry. Concurrent F Chem 550 recommended.

552. INTRODUCTION TO POLYMER CHEMISTRY II 3 credit hours

Three hours of lecture. Theory of gelation and network formation. Rubber elasticity, the glassy state and glass transition temperature, the crystalline state and crystallization kinetics, characterization of structure of solid states. Manufacturing and fabrication processes for films, fibers, and plastics. Physical properties and their relation to end use. Spring. Mr. Sarko.

Prerequisites: One year organic and physical chemistry, F Chem 550 recommended.

556. POLYMER PROPERTIES 3 credit hours

Three hours of lecture. Introduction to the physical chemistry of polymers. Includes a description and classification of polymers, crystallization, glass transition, statistics of macromolecules, rubber elasticity, visco-elasticity, polymer solutions, phase equilibria, viscosity, properties of fibers, films, foams, composites. Electrical

and optical properties of polymers. Fall. Mr. Smith.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

575. WOOD CHEMISTRY I

2 credit hours

Four hours of lecture first half of semester. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Wood extractives. Bark chemistry. Distribution of the cell wall constituents in wood. Fall. Mr. Timell.

Prerequisites: F Chem 221-224 or equivalent.

576. WOOD CHEMISTRY II

2 credit hours

Four hours of lecture second half of semester. Interaction of cellulose with water and alkali. Effect of acids on cellulose, hemicelluloses, and lignin. Sulfonation and oxidation of lignin. Action of alkali on cellulose, hemicelluloses, and lignin. Topochemistry of the major wood delignification reactions. Wood defects. Chemical by-products from wood. Manufacture of cellulose acetate and rayon. Fall. Mr. Timell.

Prerequisite: F Chem 575.

577. WOOD CHEMISTRY III

2 credit hours

Two hours of lecture. Chemistry of starch, pectin, and callose. Biosynthesis of cellulose, hemicelluloses, starch, pectin, callose, and lignin. Chemistry of the cambium and formation of xylem and phloem. Lignification. Earlywood, latewood, juvenile wood, and reaction wood. Aging and chemistry of the biodegradation of wood. Spring. Mr. Timell.

Prerequisite: F Chem 575.

578. WOOD CHEMISTRY LABORATORY

1 credit hour

One three-hour laboratory period. Wood analyses. Isolation of holocellulose and xylan. Proof of structure of cellulose. Preparation of carboxymethylcellulose. Characterization of wood polysaccharides by chromatographic techniques. Fall. Mr. Timell.

Prerequisites: F Chem 221-224 or equivalent.

584. SPECTROMETRIC IDENTIFICATION OF ORGANIC COMPOUNDS

1-2 credit hours

Two hours of lecture and discussion. The first half semester (1 credit) will deal with common classes of organic compounds; the second half semester (1 credit) will deal with more complex structures. The use of complementary information from mass, infrared, nuclear magnetic resonance, and ultraviolet spectrometry will be applied to identification of organic natural products. Fall or Spring. Mr. Silverstein.

Prerequisites: Organic chemistry; one semester of advanced organic for second credit.

796. SPECIAL TOPICS IN CHEMISTRY

*1-3 credit hours arranged
according to nature of topic*

Lectures, conferences, and discussion. Advanced topics in physical chemistry, organic chemistry, or biochemistry. Fall and Spring. Staff.

798. RESEARCH IN CHEMISTRY

*Credit hours arranged
according to nature of problem*

Independent research in physical and organic chemistry of synthetic polymers, physical and organic chemistry of natural polymers, organic chemistry of natural products, ecological chemistry, and biochemistry. One typewritten report required. Fall and Spring. Staff.

830. TOPICS IN PLANT BIOCHEMISTRY

3 credit hours

Three hours lecture and discussion. Covers topics in biochemistry unique to plants, including photosynthesis, biosynthesis of cellwall components, phenolics, terpenes, nitrogen metabolism, structure and function of plant hormones, biochemistry of differentiation and growth regulatory mechanisms. Spring (alternate years). Mr. Walton.

Prerequisites: F Chem 530, F Chem 532, or equivalents.

**850. ORGANIC CHEMISTRY OF
POLYMERS**

3 credit hours

Three hours of lecture, discussion and recitation. A broad survey of polymer forming reactions and polymeric structures. Special problems in stereochemistry, polymerization mechanisms, and the synthesis of a variety of specialty polymers. Some relations between molecular structure and useful properties. Spring. Mr. Caluwe.

Prerequisites: One year of organic chemistry and F Chem 550.

**855. PHYSICAL CHEMISTRY
OF POLYMERS**

3 credit hours

Three hours of lecture and discussion. Introduction to statistical mechanics of polymers: general problem of random flight, chain statistics and conformations, partition functions: network statistics and rubber elasticity, birefringence, swelling, crystallization. Scattering phenomena: theory of light scattering, scattering from a sphere, scattering from liquids and solids, anisotropic scattering, X-ray scattering. Fall or Spring. Mr. Sarko and Mr. Smith.

Prerequisites: F Chem 550 and 552 (or equivalent), Chemistry 656.

**884. ORGANIC NATURAL
PRODUCTS CHEMISTRY**

3 credit hours

Three hours lecture. The chemistry of terpenoids, steroids and alkaloids with an emphasis on the determination of structure by both modern instrumental methods and chemical degradation. Biogenetic considerations and the confirmation of structure by synthesis are covered. Fall or Spring. Mr. LaLonde.

Prerequisite: One semester of advanced organic chemistry.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

997. SEMINAR

1 credit hour

Seminars scheduled weekly; an average of twenty to thirty seminars are given

annually. Discussion of recent advances in chemistry. Credit is given only once to a student. Fall and Spring. Mr. Smith.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

**ECONOMICS (FORESTRY
ECONOMICS)**

**290. INTRODUCTION TO
ECONOMICS FOR FORESTRY**

3 credit hours

Three hours of lecture and discussion. Population and resources. Trends in the American economy. Supply and demand. Theory of the firm and industry. Composition, measurement, and determination of national income. Monetary and fiscal policies. The roles of government, business and labor. Comparative economic systems. General economic principles are stressed. Spring. Mr. Petriceks.

**300. INTRODUCTION TO
MACROECONOMICS**

3 credit hours

Three hours of lecture and discussion. Composition, measurement, and determination of national income. Financial institutions of the United States. Monetary and fiscal policies. The Theory of Economic Growth and problems in attaining adequate levels of economic growth. Spring. Mr. Bennett and Staff.

**301. INTRODUCTION TO
MICROECONOMICS**

3 credit hours

Three hours of lecture and discussion. Pricing and resource allocation. Supply and demand. Theory of the firm and industry. The role of labor unions in the American economy. Problems in antitrust policy. The Theory of International Trade. Fall. Mr. Bennett and Staff.

**496. SPECIAL TOPICS IN
RESOURCE ECONOMICS**

1-3 credit hours

Guided readings, lectures, and tutorial conferences for the undergraduate student from any school of the College,

designed to help him apply economic analysis to questions within his area of interest. Illustrative topics include the economics of land use and planning; of forest culture; of outdoor recreation; of water or timber management, or related resource production; of wood-using industry; and of the distribution or consumption of forest resources. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

510. PRINCIPLES OF FORESTRY ECONOMICS

3 credit hours

Two hours of lecture, three hours of laboratory. Economics of the production of forest goods and services. Land, labor, and capital and their combination in forest production. Supply and demand of various forest products and their changes over time. Economics of taxation and public policy formation. Emphasis is placed upon principles and methods of analysis useful in understanding and in making resource management decisions. Fall. Mr. Christiansen.

Prerequisite: F Econ 301 or equivalent.

511. ECONOMICS OF THE FOREST BUSINESS

3 credit hours

Two hours of lecture, three hours of laboratory. Economic evaluation of alternative uses of land, labor, and capital in the operation of forest properties and related marketing and processing enterprises. Emphasis is on application of principles and methods of economic analysis. Part of the term is spent in appraising a forest property and preparing a plan for its operation. Complementary to instruction in F Mgt 556. Spring. Mr. Christiansen.

Prerequisite: F Econ 510 or permission of the instructor.

520. ECONOMICS OF WOOD-USING INDUSTRIES

3 credit hours

Three hours of lecture and discussion. Structure and organization of selected wood-using industries. Analysis of decision making by the firm. Principles of production and marketing including demand and cost analysis and pricing. Special issues and current problems of

the industries, and introduction to the newer mathematical and statistical tools for meeting them. Spring. Mr. Armstrong.

Prerequisite: F Econ 290 or equivalent.

550. FORESTRY AND ECONOMIC DEVELOPMENT

3 credit hours

Three hours of lecture and discussion. Study of the role of forest resources in the process of economic development. Characteristics of forest resources which are important for economic development are analyzed in detail. Interrelationships between biological, technological, and institutional factors are stressed. Fall. Mr. Petriceks. Offered to seniors and graduate students in environmental and resources management. Open to others by permission of instructor.

Prerequisite: F Econ 510 or its equivalent.

570. ECONOMICS OF OUTDOOR RECREATION

3 credit hours

Group discussion, lectures, guided reading, and student essays on the economic aspects of outdoor recreation. Major topics include: supply and demand for outdoor recreation; theories of value and choice for both recreationists and recreation-resource managers; the role of outdoor recreation in economic development; and application of economic analysis to recreation planning and public policy issues. Spring. Mr. Canham.

Prerequisites: F Econ 290 or 301, or equivalent; F Mgt 572 recommended.

710. ADVANCED PRINCIPLES OF FORESTRY ECONOMICS I

3 credit hours

Two hours of lecture, two hours of discussion. Intensive study of the microeconomics of forestry. Offered only to graduate students. Fall. Staff.

711. ADVANCED PRINCIPLES OF FORESTRY ECONOMICS II

3 credit hours

Two hours of lecture, two hours of discussion. Intensive study of the macroeconomics of forestry. Offered only to graduate students. Spring. Staff.

796. SELECTED TOPICS IN THE ECONOMICS OF FORESTRY

Credit hours to be arranged

Study of a topic in forestry economics, with emphasis on wide reading, original thinking, and analytical writing. Fall and Spring. Staff.

797. SEMINAR

1-3 credit hours

Group discussion and individual conference. Critical examination of economic ideas and policies in forestry. Topics of interest to the group are selected for study, such as current developments in analytical method or in economy policy, the economic problems of small business in forestry, national or world requirements for the goods and services of the forest, or the economy of a forest region. Primarily for graduate students in forestry economics and world forestry. Fall and Spring. Staff.

800. HISTORY OF ECONOMIC THOUGHT IN FORESTRY

3 credit hours

Three hours of discussion or conference. Systematic study and critique of the development of the thinking of foresters and economists with respect to some segment of the subject matter of forestry economics. Review of major individual contributions to thought and the influence of leading scholars upon the thinking of others. Appraisal of the leading schools of thought. Offered only to graduate students. Fall or Spring. Mr. Bennett.

830. RESEARCH METHODS

3 credit hours

Three hours of discussion or conference. Study of the elements of research methodology and their application in identifying, analyzing, and resolving problems in forestry economics. Fall. Staff.

Prerequisite: Offered to Ph.D. candidates in Forestry Economics. Open to others by permission of instructor.

840. PROFESSIONAL WORKSHOP IN FORESTRY ECONOMICS

3 credit hours

Two hours of seminar and one three-hour laboratory each week. F Econ 840 is an internship-workshop in the inter-

pretation of forest economics. The seminars are devoted to problems of programming, materials, instruction, testing, and evaluation. The laboratory incorporates leading a one-hour discussion group in F Econ 301, with preparation for that discussion group and with the writing of a report on the laboratory to be used in a subsequent seminar meeting. Fall. Mr. Bennett.

Prerequisites: Econ 605, Econ 606, and either F Econ 830 or permission of instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

ENGINEERING (FOREST ENGINEERING)*

300. FOREST ENGINEERING PROBLEMS

1 credit hour

One hour of lecture and discussion. An introduction to methodologies for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the entire resource environment. Fall and Spring. Staff.

Prerequisite: Junior standing in Forest Engineering.

301. PLANE AND GEODETIC SURVEYING

3 credit hours

Two hours lecture and recitation, three hours of laboratory. A treatment in depth of the principles of plane surveying, with particular emphasis on the analysis of errors, curvilinear survey, astronomical observations, and potential computer relationships. Spring. Mr. Bender.

Prerequisite: AM 591.

*See also listings for Forest Management.

310. FOREST ENGINEERING PROBLEMS

3 credit hours

Three hours of lecture and discussion. An introduction to methodologies of forest measurements for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the entire resource environment. Fall. Staff.

340. HYDROLOGY

3 credit hours

Two lectures and three hours of laboratory per week. The mechanics of water storage and dispersion; hydrostatics; stream function; velocity potential; dimensional analysis and momentum theory. The natural hydrologic cycle is studied in relationship to changes and structural controls imposed by man. Spring. Mr. Tully.

Prerequisites: Dynamics (or concurrent), Introductory Statistics.

342. HYDRAULICS IN CONSTRUCTION

4 credit hours

Three hours of lecture, three hours of laboratory. The physical, mechanical, thermal, and hydraulic properties of fluids relevant to the construction industry. A study of solutions to hydraulic problems in contemporary construction activities. Not open for credit to forest engineering students. Spring. Staff.

Prerequisites: Physics and differential calculus.

410. STRUCTURES

4 credit hours

Three hours of lecture, three hours of laboratory. Engineering principles in the analysis, planning, design, construction, and maintenance of forest structures such as timber bridges, trusses, towers, dams, water supplies, sewage systems, and other facilities. Properties of timber, concrete, steel, and other structural materials. Fall. Mr. Tully.

Prerequisite: CIE 325 or concurrent registration.

412. PRINCIPLES OF PRODUCTION (HARVESTING)

3 credit hours

Three lectures per week. Fundamentals of harvesting wood products for optimum utilization; principles of production management, materials handling and transportation systems, inventory and cost control, product and market development utilization problems. Analysis of integrative case situations for wood-based enterprises. Fall. Mr. Palmer.

Prerequisite: F Mgt 522.

442. HYDRAULIC OPERATIONS

2 credit hours

Three hours of lecture, three hours of laboratory. A seven-week course beginning at mid-semester, which studies solutions to hydraulic problems in contemporary construction operational activities. Not open to students having previous credit for F Engr 342. Spring. Staff.

Prerequisites: Senior class standing in engineering or permission of instructor based on a background in hydraulics.

497. UNDERGRADUATE SEMINAR

1 credit hour

Literature surveys and seminars on topics of Forest Engineering interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Fall and Spring. Staff.

498. RESEARCH PROBLEM IN FOREST ENGINEERING

1-3 credit hours

Independent research in topics in Forest Engineering for the highly motivated undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions, and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring. Staff.

Prerequisite: Consent of instructor.

502. TERRESTRIAL GEODESY

3 credit hours

Two hours lecture and three hours laboratory. Theory and techniques of collection, reduction, and adjustment of

precise geodetic measurements for leveling, triangulation, and trilateration. Fall. Mr. Bender.

Prerequisite: F Engr 301 or equivalent.

503. ASTRO-GEODESY

3 credit hours

Two hours lecture and three hours laboratory. Theory and techniques of collection, reduction, and adjustment of astronomical observations for position, direction, and time determination with emphasis on satellite geodesy. Spring. Mr. Bender.

Prerequisite: F Engr 301 or equivalent.

510. TRANSPORTATION SYSTEMS

3 credit hours

Two hours of lecture and three hours of laboratory. Interrelationships among natural features, transportation types, design, and management objectives to provide the most effective system within the given framework. Basic engineering principles in the planning location, design, construction, and maintenance of suitable transportation systems to serve various aspects of forest resource management. Spring. Staff.

Prerequisites: F Engr 301 and F Engr 531 or equivalents.

530. SOIL MECHANICS

2 credit hours

Two hours of lecture, three hours of laboratory (9 weeks only). The physical, mechanical and hydraulic properties of cohesive and noncohesive soils. A nine-week course, concluding with specifications of engineering soils. Credit towards forest engineering degree may be granted only by the completion of additional assigned work. Fall. Mr. Tully.

Prerequisite: Senior class standing or permission of instructor.

Note: A student may not enroll in and receive credit for both F Engr 530 and F Engr 531.

531. SOIL MECHANICS FOR ENGINEERS

3 credit hours

Two hours of lecture, three hours of laboratory. The physical, mechanical, and hydraulic properties of cohesive and noncohesive soils. Application of these and other engineering principles to the design

of earthen structures common to the forest environment. Fall. Mr. Tully.

Prerequisites: F Engr 340; also, CIE 325 concurrently.

Note: A student may not enroll in and receive credit for both F Engr 530 and 531.

540. HYDROLOGIC CONTROLS

3 credit hours

Three hours of lecture and discussion. A continuation of F Engr 340, emphasizing the application of hydrologic principles. Basic hydraulics of controlling structures, open channel flow, sedimentation, filtration systems, reservoirs, and water law as applied to forest and range land hydrology. Spring. Mr. Tully.

Prerequisites: F Engr 340, F Engr 530 or F Engr 531, CIE 327, or equivalents as evaluated by the instructor.

560. THEORY OF ERRORS AND ADJUSTMENTS

3 credit hours

Two hours of lecture and three hours of laboratory. The theory of errors and adjustment of observations oriented toward geodesy and photogrammetry. Topics include error definitions, weighted observations, method of least squares, matrix algebra in adjustments, variance-covariance matrix, the error ellipse, and the general case of adjustment. Fall or Spring. Mr. Brock.

Prerequisite: Calculus, AM 591, or equivalent.

563. PHOTOGRAMMETRY

3 credit hours

Two hours of lecture and discussion, three hours of laboratory. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation, and unique requirements are considered. Fall and Spring. Mr. Brock.

Prerequisite: F Mgt 201 (or F Mgt 301 concurrent).

564. PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. Mathematical theory of photogrammetry including space resection, orientation and intersection. The theory

and use of photogrammetric analogue computers in providing resource engineering maps. Fall. Mr. Brock.

Prerequisite: F Engr 563 or equivalent.

566. REMOTE SENSOR INTERPRETATION

3 credit hours

Two hours of lecture, three hours of laboratory. An introduction to remote sensing technology as applied to detection and analysis of the forest environment, soil, water, climate, and vegetation, as an aid to multiple use management. Fall and/or Spring. Staff.

567. REMOTE SENSOR THEORY

3 credit hours

Two hours lecture and three hours laboratory of an in-depth coverage of the theory of remote sensing of the electromagnetic spectrum and the various methods of phase and amplitude recording. Holographic, photographic, and line scan recordings will be covered. Spring. Staff.

Prerequisite: F Engr 563, Math 398, or equivalent.

599. FOREST ENGINEERING PLANNING

4 credit hours

Three hours of lecture and three hours of laboratory. A synthesis of the fundamental areas of forest engineering in the planning of the physical development of the forest resources. Specific design studies will be made emphasizing the interrelationship of man, forest resources and their multiple services. These studies will lead to the development and application of planning to simulated realistic conditions. Spring. Staff.

664. TERRESTRIAL AND NANTOPOGRAPHIC PHOTOGRAMMETRY

3 credit hours

Two hours of lecture, three hours of laboratory per week. The theory and applications of terrestrial and nontopographic photo measurements. Photo-Theodolites, short-focus cameras, and microscopes are used and calibrated to provide meaningful quantitative data from photographs. Spring. Mr. Brock.

Prerequisites: F Engr 563 and AM 360 or equivalent.

760. ANALYTICAL PHOTOGRAMMETRY I

3 credit hours

Two hours of lecture, three hours of laboratory per week. Mathematical theory of photogrammetry including space resection, orientation, intersection, and aerial triangulation. Fall. Mr. Brock.

Prerequisites: F Engr 563 and AM 360 or equivalent.

761. ANALYTICAL PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. A continuation of F Engr 760 leading to more extensive analytical solutions with frame and nonconventional photography. The distortions present in photographs are analyzed and camera and comparator calibrations are treated. Spring. Mr. Brock.

Prerequisite: F Engr 760.

762. INSTRUMENTAL PHOTOGRAMMETRY I

3 credit hours

Two hours of lecture, three hours of laboratory. The theory and practice of extracting information from photographs with the aid of photogrammetric plotters. Fall. Mr. Brock.

Prerequisite: F Engr 563 or equivalent.

763. INSTRUMENTAL PHOTOGRAMMETRY II

3 credit hours

Two hours lecture, three hours laboratory. The major subjects of study are photogrammetric optics, the theory and design of optical and mechanical plotters and automatic mapping systems. Spring. Mr. Brock.

Prerequisite: F Engr 762 or permission of instructor.

797. SEMINAR

1 credit hour

Literature surveys and seminars on topics of Forest Engineering interest and importance. Subjects to be generated by faculty and students and to be announced prior to registration. Fall and Spring. Staff.

**798. RESEARCH IN FOREST
ENGINEERING**

*Credit hours arranged according
to nature of problem*

Independent research topics in Forest Engineering for graduate students who desire specialized knowledge or research experience. Tutorial conferences, discussions and critiques scheduled as necessary. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral dissertation. Fall and Spring. Staff.

**ENGLISH (COLLEGE OF
ENVIRONMENTAL SCIENCE AND
FORESTRY COURSES)**

**210. ADVANCED COMPOSITION
AND LITERATURE**

3 credit hours

Further development of reading and writing skills acquired in freshman English. Understanding of imaginative literature promoted through the study of selected works in American literature in their historical context. Practice in the principles and techniques of critical writing coordinated with reading assignments. Fall. Mrs. Sutton and Mr. Lalor.

211. TECHNICAL WRITING

3 credit hours

Instruction in the principles and techniques of technical writing in general; in the letter, memorandum, and report, and in the special techniques of technical writing in particular. Course work includes lectures and discussions, reading assignments in the required text and supplementary materials, and numerous written assignments including a formal report presenting the results of an investigation. Spring. Mrs. Sutton and Mr. Lalor.

**215. FUNDAMENTALS OF PUBLIC
SPEAKING**

3 credit hours

Study of and practice in the application of the principles of good oral communication in extemporaneous person-to-group format. Students participate in information and problem-solving group discussions and prepare, deliver, listen to, and criticize information and persuasive talks. Fall. Mr. Lalor.

**400. AMERICAN WRITERS AND
THE NATURAL
ENVIRONMENT**

3 credit hours

The tracing of the changing concepts of the natural environment in American writings from the Puritans to the present. Fall. Mrs. Sutton.

**ENTOMOLOGY (FOREST
ENTOMOLOGY)***

**300. PRINCIPLES OF FOREST
ENTOMOLOGY**

2 credit hours

Elements of insect classification, living requirements, and control manipulations that are prerequisite, with further study, to an understanding of insects in relation to applied aspects of forestry. One hour of lecture, three hours of laboratory/field work. Spring. Mr. Allen.

**500. ELEMENTS OF FOREST
ENTOMOLOGY**

3 credit hours

Two hours of lecture, three hours of laboratory/field work. General classification of insects, morphology, physiology, ecology behavior, and basic principles of population control. Emphasis through illustration is on the role of insects in the forest environment. Fall. Mr. Simeone.

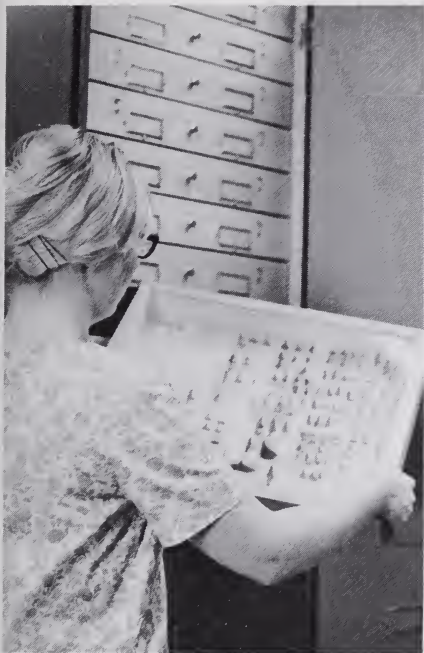
Prerequisites: F Bot 100 and F Zool 100.

**502. FOREST AND SHADE TREE
ENTOMOLOGY**

3 credit hours

Two hours of lecture, three hours of laboratory/field trip. Important forest and shade tree insects; detection, evaluation, prevention, and control of their

*See listings for Forest Biology.



damage; their relation to silviculture and management of forests and shade trees. Spring. Mr. Lanier.

Prerequisite: F Ento 500 or F Ento 300.

504. INSECTS AFFECTING FOREST PRODUCTS

3 credit hours

Two hours of lecture and one hour of laboratory. Biology, identification, ecology of insect and wood interrelations, prevention of injury and control of insects injurious to forest products and wood in use. Spring. Mr. Simeone.

Prerequisite: F Ento 500 or F Ento 300. Exceptions with permission of instructor.

Note: F Ento 504 will next be offered in the Spring of 1975.

505. SURVEY OF ENTOMOLOGICAL LITERATURE AND HISTORY

1 credit hour

One hour of lecture. A survey of history of entomology and related sciences. Library techniques and literature sources are discussed with emphasis on entomological bibliography. Spring. Mr. Brezner.

550. FOREST AND AQUATIC INSECTS

2 credit hours

The forest and aquatic insects of Cranberry Lake Region and their role in these environments and habitats. Insect collection required. Summer (four-week period). Cranberry Lake Field Biology Station. Mr. Lanier.

Prerequisites: Background in botany, zoology, systematics, and ecology.

580. INSECT MORPHOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. A comparative study of the external morphology of insects emphasizing evolutionary trends, especially modifications of homologous structures. Topics of special importance include intersegmental relationships, feeding, sensory mechanisms, locomotion, and reproduction. Fall. Mr. Kurczewski.

Prerequisite: F Ento 500.

590. MEDICAL ENTOMOLOGY

3 credit hours

Two hours of lecture, three hours of lab. Study of arthropods affecting man, domestic animals and wildlife with emphasis on their biology, control, and relationship to vertebrate disease. Spring. Staff.

Prerequisite: A beginning course in biology, entomology, zoology or consent of instructor.

610. GENERAL INSECT TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Identification and classification of the important orders and families of insects; acquaintance with pertinent taxonomic literature and use of keys; and understanding of evolutionary principles and concepts and a knowledge of systematic theory and practice. Insect collection required. Spring. Mr. Kurczewski.

Prerequisites: F Ento 500, F Ento 580.

620. AQUATIC ENTOMOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. The biology, ecology, and identification of fresh water insects, with

emphasis on the role of aquatic insects in the hydrobiome. Fall. Mr. Brezner.

Prerequisite: F Ento 500 or its equivalent.

630. INSECT PHYSIOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Study of the life processes in insects; introduction to modern physiological instrumentation and laboratory methods. Spring. Mr. Brezner.

Prerequisite: F Biol 330.

660. TOXICOLOGY OF INSECTICIDES

3 credit hours

Two hours of lecture, three hours of laboratory. The mode and basis of action of various insecticides, phenomena of bio-transformation, selectivity, resistance, synergism and dosage-mortality relationships. Spring. Mr. Nakatsugawa.

Prerequisite: F Biol 330, or equivalent course in physiology or biochemistry.

720. POPULATION DYNAMICS OF FOREST INSECTS

3 credit hours

Two hours of lecture, one hour seminar. Interacting environmental factors which influence the relative abundance and distribution of forest insects, ecological principles as applied to problems in forest entomology, and pest management. Introduction to theories of population regulation and the study of the dynamics of forest insect populations; individual problem and seminar. Fall. Mr. Allen.

Prerequisites: F Ento 500, F Zool 520, AM 571, or equivalents.

796. SPECIAL TOPICS IN FOREST ENTOMOLOGY

Credit hours arranged according to nature of work

Special instruction, conference, advanced study, and research projects in the fields of insect toxicology, insect physiology, taxonomy of immature insects, phases of biology and ecology of insects. Typewritten report required in some fields. Fall and Spring. Staff.

797. SEMINAR

1 credit hour

One hour of conference per week. Assigned reports and discussion of topics in entomology. Fall and Spring. Mr. Nakatsugawa and Staff.

798. RESEARCH PROBLEMS IN FOREST ENTOMOLOGY

Credit hours arranged according to nature of problem

Comprehensive report required in some projects. Fall and Spring. Staff.

810. ADVANCED INSECT TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Methods, procedures, and concepts of systematics. Examples and material will be drawn from among important groups of forest insects. Fall. Mr. Lanier.

Prerequisites: F Ento 580 and F Ento 610.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

ENVIRONMENTAL STUDIES

100. INTRODUCTION TO ENVIRONMENTAL STUDIES

3 credit hours

Lecture and discussion on the nature of man, his social, cultural, economic, and political institutions and how these condition his views of the environment. Fall. Staff.

101. HUMAN ECOLOGY

3 credit hours

Study of the principles of ecosystem structure and function developed in the context of human values and societal structures. Spring. Staff.

Prerequisite: ES 100.

497. UNDERGRADUATE SEMINAR
1 credit hour

Seminars on problems of environmental concern. The subject of the seminar will be announced prior to registration. Fall and/or Spring. Staff.

498. UNDERGRADUATE PROBLEM
1-3 credit hours

Interdisciplinary research designed to solve environmental problems. Selection of subject matter to be determined by students in conference with the Undergraduate Environmental Studies Advisory Group. Problem analysis and programs for solution in the form of a final report required. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

GENERAL FORESTRY

032. ORIENTATION
No credit

One hour of lecture and discussion per week designed to introduce the freshman student to the College and its academic and social environs. Fall. Mr. H. Payne and Staff.

100. FOREST RESOURCES AND THE ENVIRONMENT
3 credit hours

Three hours of lecture and discussion per week dealing with forest and related resources in relation to national and world needs for forest goods and services. Particular emphasis is placed on forest resources policies, management, and use in relation to the environmental concerns of society as viewed today and in the foreseeable future. Fall. Staff.

451. WORLD FORESTRY
RESOURCES: PROBLEMS
AND PROSPECTS
3 credit hours

Three hours of lecture and discussion plus guided readings, pertaining to world forest resources and the problems and opportunities associated with their use and development. Major topics include: world forest resources; production and trade; principal wood-producing countries; forestry and the problems of underdevelopment; and special areas and topics of interest to world forestry. Spring. Staff.

Prerequisite: Upper division status. Senior status preferred.

502. APPLIED COMMUNICATIONS
3 credit hours

Two hours of lecture. Three hours of laboratory during first part of course. Major media production project required. Course objective is to acquaint students with the basic principles of instructional communications in the teaching-learning process. Various media including television, motion pictures, exhibits, illustrated lectures, slide talks, newspapers, etc. are examined with emphasis on their utilization in environmental education. Also, consideration is given to instructional design for meeting predetermined learning objectives in various publics—lay and professional adult audiences, school children, etc. Spring. Mr. Hanselman and Staff.

550. RANGE MANAGEMENT
2 credit hours

Two hours of lecture. Range ecology, animal husbandry, management practices, and administrative aspects of range resources. Spring.

751. WORLD FORESTRY
3 credit hours

Three hours of lecture and discussion. World forest distribution and types; regional production and consumption of forest products; international trade in timber and related products; the role of forest resources in development; and special topics: tropical forestry, comparative forest policies and programs, forestry education, the problems of developing countries, international cooperation in forestry development, the role of the United States in world forestry, etc. Fall or Spring. Staff.

Prerequisite: Graduate status.

798. PROBLEMS IN WORLD FORESTRY
Credit hours to be arranged

Provides an opportunity for the student to pursue his study of forestry, or some phase thereof, in a global, regional, or national (United States and Canada excluded) setting, and to gain experience in original thinking and analytical writing. Fall and Spring. Staff. For graduate students, primarily in World Forestry.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

LANDSCAPE ARCHITECTURE

Graphics

181. GRAPHICS I

2 credit hours

Six hours of studio per week. Two three-hour drafting room periods. Elements of perspective, isometric, oblique, and orthographic projection. Practical applications of these principles in machine and architectural drawing, including piping, electrical, and plant layouts. Spring.

182. ART MEDIA I

1 credit hour

Three hours of studio per week. Studios, group instruction and demonstrations, individual critiques, sketching and drawing from model, from still life, and landscape drawing. Field trips. Primary emphasis on "form description" drawing skills. Also taught: visual perspective, pictorial composition, and techniques in various black and white media. Fall.

183. ART MEDIA II

1 credit hour

Three hours of studio per week. Studio assignments, group instruction, and demonstrations, individual critiques, sketching and drawing from model, from still life, and landscape drawing. Field trips. Primary emphasis on "form description" drawing skills. Also taught: visual perspective, pictorial composition, and techniques in various black and white media. Spring.

280. TECHNICAL DRAWING

1 credit hour

One three-hour drafting room period. Elements of perspective, isometric, oblique, and orthographic projection. Prac-

tice in freehand and instrument drawing. Fall.

281. LANDSCAPE ARCHITECTURAL DRAFTING

3 credit hours

One hour of lecture and six hours of studio per week. Lectures, readings, and exercises through studio assignments in graphic techniques, including freehand and instrument drawing, drafting, and lettering. Exposure to various graphic media, reproductive processes, axonometric, oblique, and orthographic projections. Perspective, architectural, and topographic drawing. Spring.

284. ART MEDIA III

1 credit hour

Three hours of studio per week. Studios, field trips, group instruction, criticism and demonstration, painting in oil, water color, and acrylics. A studio painting course in oil, watercolor, or acrylics to familiarize and develop color media skills and painting expressiveness. Fall.

Prerequisite: Graph 182 or 183, or permission of instructor.

285. ART MEDIA IV

1 credit hour

Three hours of studio per week. Laboratory-Studios, field trips, group instruction, criticism and demonstration; painting, sculpture, and other three-dimensional media. A studio course in various three-dimensional art forms and painting. Emphasis on individual experimentation and self-expression. Spatial relationships will be studied through the use of the third dimension, both from standpoint of "enclosure" and "setting." Spring.

Prerequisite: Graph 182 or 183, or permission of instructor.

382. GRAPHICS

2 credit hours

One hour of lecture and three hours of studio per week. Lectures, studio problems, and assigned reading. Study of the various graphic and three-dimensional techniques used to simulate the physical environment. Topics include multiview and perspective drawing, shades and shadows, model construction and interpretation. Fall.

Prerequisite: One semester of technical drawing or equivalent.

383. GRAPHICS

2 credit hours

One hour of lecture and three hours of studio per week. Lectures, studio problems, and assigned reading. Study of the various graphic and three dimensional techniques used to simulate the physical environment. Topics include the development of those subject areas introduced in Graph 382, and new areas related to various graphic media, reproduction processes, computer graphics, and techniques of animation. Spring.

Prerequisite: Graph 382 or equivalent.

582. ADVANCED MEDIA

1-3 credit hours

Three hours of studio per week. Discussions, demonstrations, critiques, and individual study. Study oriented toward perception and self-expression, use and possibilities of various media, as selected by student and instructor. Fall and Spring.

Prerequisite: Prior art media training or experience, and permission of instructor.

Environmental Influences

211. GENERAL GEOGRAPHY

3 credit hours

Three hours of lectures, assigned readings, written reports per week. Discussion of basic geographic concepts and methods, explanation of the significance of man-land relationships as exemplified through the regional distribution and spatial patterns of natural and cultural features, description of geologic processes and other physical features such as soils, climates, and natural vegetation. Not open to geography or geology majors. Spring.

311. PRINCIPLES OF LAND USE

3 credit hours

Three hours of lecture, reports, assigned readings per week. Explanation of factors which influence the use, development, and control of land. Discussion of government's role in land development and control. Detailed consideration of

unique values of land, competition for the use of space, planning for better land use, introduction to planning concepts and techniques, and other topics. Spring.

470. ART HISTORY

3 credit hours

Three hours of lecture per week. Informal lectures and class discussion will emphasize and review assigned text and other readings and handout notes. Slides will be shown regularly; notebooks, reports, quizzes, and examinations. Evolutionary nature of the main cultural periods of Western man and fine arts as man's selected environment will be the course emphasis. Fall.

471. HISTORY OF LANDSCAPE ARCHITECTURE

3 credit hours

Three hours of lecture per week. Informal lectures, and class discussion, notebooks, reports, assigned text, and assigned reserve shelf reading, optional text, and handout notes, weekly quizzes and exams. Slides. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where significant or influential on Western Man. Study of historical personalities as well as periods that are of environmental concern up into the modern period. Spring.

Prerequisites: EI 470, or equivalent History of Arts course.

550. FUNDAMENTALS OF CITY AND REGIONAL PLANNING

3 credit hours

Three hours of lectures, assigned readings, written reports per week. Discussion of the meaning and purposes of city and regional planning. Examination of the historical development of urban places. Explanation of the principal elements of the comprehensive planning process, including goal formulation and decision-making, social and advocacy planning, planning for community facilities, and planning administration. Discussion of the methods and objectives of city and regional planning. Fall.

Prerequisite: Permission of instructor.

Landscape Architecture

310. ELEMENTS OF LANDSCAPE ARCHITECTURE AND ENVIRONMENTAL DESIGN FOR ARCHITECTURE STUDENTS

2 credit hours

Two hours of lectures, discussions and assigned readings per week. A successive presentation of a landscape architectural philosophy toward the physical environment and environmental design. Presentation of operational systems involved in the physical environment from technical, functional and symbolic points of view. Fall.

Prerequisite: Enrollment in School of Architecture or permission of instructor.

311. ELEMENTS OF LANDSCAPE ARCHITECTURAL PRACTICE FOR ARCHITECTURE STUDENTS

2 credit hours

Two hours of lectures, problems, and assigned readings per week. An introduction to the design elements of Landscape Architecture in contemporary application and practice. Spring.

Prerequisites: LA 310; enrollment in School of Architecture or permission of instructor.

322. BASIC DESIGN

2 credit hours

One hour of lecture and three hours of laboratory per week. Lectures, studios, criticism, quizzes, exams, reports, composing and rendering finished abstract design plates and constructions. Course presents a theory of abstract design applicable to all graphic arts, and offers studio time in which to apply theory to graphic problems. Presented are the mechanics of design, design terminology, a basis of design criticism, and experience in basic design. Fall.

324. INTRODUCTION TO LANDSCAPE ARCHITECTURE

3 credit hours

Three hours of lecture per week. Lecture, and class discussion, notebooks, reports, assigned text reading and assigned reserve shelf reading, research reading,

weekly quizzes and exams, slides, movies, and guest lectures, field trips. Course describes the field of Landscape Architecture, its background, philosophy, interdisciplinary relationships, its spectrum of interest, the human needs it responds to. It is not a course in design or design theory but in the background basis for landscape design. Fall.

325. LANDSCAPE DESIGN STUDIO I

2 credit hours

Six hours of studio per week. Studio assignments, drafting, readings, discussion, and field trips. An introduction to the visual-mental concepts basic to landscape architectural design. Various abstract problems to illustrate elements of the physical environment and their effect upon man. Special attention to the spatial context of these elements and spatial sequences characteristic of the natural and man-made environments. Spring.

Prerequisites: LA 324, LA 322, or permission of instructor.

Note: Student field trip expense \$125-\$150.

343. STRUCTURAL MATERIALS AND ELEMENTS

3 credit hours

Three hours of lectures, problems and assigned reading per week. Study of the physical properties of materials and structural elements commonly used in landscape architecture. Topics include elementary statics and strength of materials, wood, metal, plastics, concrete, masonry, retaining walls, dams, foundations. Spring.

345. ELEMENTS OF SITE ENGINEERING

3 credit hours

Two hours of lectures and three hours of studio per week. Lectures, problems, drafting, modeling, and assigned reading. The study of land form and its technical expression through grading plans, sections, profiles, layout plans, and earthwork quantity computation. Principles of soil mechanics and land drainage and their application to surface and subsurface drainage systems. Spring.

Prerequisites: F Mgt 201 and EI 211.

420. LANDSCAPE DESIGN
THEORY I

2 credit hours

Two hours of lectures, discussions, critiques, and assigned readings per week. A successive presentation of data on the physical environment beginning with the macroscape of nature to the intensively humanized urban site. Principles of basic organization of land areas, composition of elements, analysis of sites and programs, the process, purpose, and implication of the practice of design. Fall and Spring.

Prerequisite: 4th year status or permission of instructor.

422. LANDSCAPE DESIGN
STUDIO II

4 credit hours

Twelve hours of studio per week. Studio problems, research, drafting, and field trips. The processes and methods of design considerations of variances upon the natural physical environment, ranging from broad regional areas to specific site concerns. Fall.

Prerequisites: LA 324, 325, 322, Graph 382, 383, or permission of instructor.

423. LANDSCAPE DESIGN
STUDIO III

4 credit hours

Twelve hours of studio per week. Studio problems, research, and drafting. Interaction of cultural influences with the physical environment, with attention focusing on the resulting forms. Observations and illustrations of people and places as inputs into the design process. Spring.

Prerequisite: LA 422 or permission of instructor.

425. ORIENTATION FOR
EXPERIENTIAL STUDIO

3 credit hours

Three hours lecture and recitation. Investigation and documentation of an area of specialized study to be engaged in an off-campus location. Lectures, discussion, readings, and research. Fall and Spring.

Prerequisite: Permission of instructor.

430. PLANT MATERIALS CULTURE

3 credit hours

Three hours of field study and lectures per week. Trees, shrubs, vines, and grasses. Identification, culture, common practices in pest and disease control. Fall.

Prerequisite: LA 333.

433. PLANT MATERIALS

3 credit hours

Field trips and discussion. Ornamental woody plant identification. Observation and sketches of outstanding examples of planting design. Three weeks, Summer Session.

Prerequisite: LA 430 or permission of instructor.

440. SITE DEVELOPMENT SYSTEMS

3 credit hours

Three hours of lectures, problems and assigned reading per week. Study of various engineering systems as they relate to the design and development of land. Topics include pedestrian ways, utilities (water, solid waste, sewage, electric, gas), road location and design, shore protection, swimming pools. Fall.

Prerequisite: Surveying.

495. SELECTED READINGS IN
ENVIRONMENTAL STUDIES

1-3 credit hours

Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall, Spring and Summer Session.

Prerequisite: Permission of instructor.

498. INTRODUCTORY RESEARCH
PROBLEM

1 credit hour

Guided study of a selection of problems relating to landscape architecture and environmental design. Emphasis on study procedure and methods employed. Fall and Spring. Staff. Enrollment at

periodic intervals throughout the semester.

Prerequisite: Permission of instructor.

522. LANDSCAPE DESIGN STUDIO IV

4 credit hours

Twelve hours of studio per week. Studio problems, research, drafting, and field trips. Concentration on complex urban problems. Concern for social and psychological considerations of the individual and large groups of people, their interaction and resultant forms of the environment. Spring.

Prerequisite: Permission of instructor.

524. EXPERIENTIAL STUDIO

16 credit hours

48 hours per week. The articulation of the study proposal established in LA 425, as approved by faculty, through research, readings, field study with graphic and written documentation, and group discussion. Academic study in an off-campus location in an area of landscape architectural significance, as described and delineated in a student-prepared proposal approved by the faculty. Not available for Graduate Credit. Fall or Spring.

Prerequisites: LA 425 or equivalent and LA 423 or permission of instructor.

525. LANDSCAPE DESIGN STUDIO V

4 credit hours

Twelve hours of studio per week. Investigation of a problem in landscape architecture as proposed by the student and conducted in conjunction with faculty advisor. Spring.

Prerequisite: LA 522 or permission of instructor.

527. LANDSCAPE DESIGN STUDIO V

4 credit hours

Twelve hours studio per week. Studio problems, research, reports, and field trips. Concentration on regional landscape problems, the techniques of their analysis and derivation of their significance to the practice of landscape design. Spring.

Prerequisite: LA 522 or permission of instructor.

530. HERBACEOUS PLANT MATERIALS

2 credit hours

Two hours of lectures, study problems, assigned readings and field trips per week. Identification, understanding, and design use of nonwoody plants. Fall.

Prerequisite: Permission of instructor.

532. WOODY PLANT MATERIALS

3 credit hours

Three hours of lecture per week. Field study, lectures, slide presentations and readings. An elective course providing opportunity for extension of basic knowledge in the identification and design of woody plant materials in professional practice. Fall or Spring.

Prerequisites: LA 333 and LA 430 or permission of instructor.

542. HIGHWAY LOCATION AND DESIGN

3 credit hours

Two hours of lecture, three hours of studio per week. Lectures, assigned reading, studio projects, field trips. Environmental, engineering and human factors which determine highway location and design, particularly as they relate to landscape architectural concerns. Location, alignment, geometric design, drainage, roadbed construction, pavements, roadside development. Fall or Spring.

Prerequisites: LA 343, 440 and 540, or permission of instructor.

545. PROFESSIONAL PRACTICE STUDIO II

2 credit hours

Three hours of studio, one hour of recitation per week. Studio problems research, discussion, and recitation sessions on the processes and methods of office practice. Emphasis on all aspects of site-development. Spring.

Prerequisite: Permission of instructor.

547. PRINCIPLES OF PROFESSIONAL PRACTICE

2 credit hours

Two hours of lecture per week. Lectures, assigned readings, reports, cost estimates, specifications, contracts, professional ethics, registration laws, professional practice. Spring.

Prerequisite: Upperclass standing.

561. ECOLOGICAL ARCHITECTURE

3 credit hours

One hour of seminar, six hours of studio per week. Study of special relationships of architectural form to predominantly natural environments, particularly parks and other recreation areas. A variety of studio projects involving program preparation, preliminary design and detailed drawings. Spring.

Prerequisite: LA 560 or permission of instructor.

562. ARCHITECTURE

3 credit hours

Two hours of lecture, three hours studio. Discussion and investigation of the principles of architectural design and procedures of architectural practice. Functional building systems coupled with site and program considerations as to their relative impacts on architectural form. Spring.

Prerequisite: Permission of instructor.

595. SELECTED READINGS IN LANDSCAPE ARCHITECTURE

1-3 credit hours

Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall, Spring and Summer Session.

Prerequisite: 5th year graduate status or permission of instructor.

597. LANDSCAPE ARCHITECTURE SEMINAR

2 credit hours

Two hours of seminar per week. Discussion of current social, political, cultural, and technological problems as to their relationship to the physical environment. Fall and Spring.

Prerequisite: Permission of instructor.

598. RESEARCH PROBLEM

1-3 credit hours

Independent study of selected areas of environmental interest. Emphasis on a self-disciplined study, development of

procedures and techniques to be employed in environmental design and planning. Engagement with specific sites and problems as proposed for study by individual communities. Fall and Spring. Enrollment at periodic intervals throughout the semester.

Prerequisite: Permission of instructor.

620. GRADUATE STUDIO I

4 credit hours

Twelve hours of studio per week. Disciplines and techniques used by the landscape architect in problem identification, analysis, and solution strategies. Emphasis is on processes, not on product. Fall.

Prerequisite: Permission of instructor.

697. SEMINAR—TOPICS AND ISSUES OF THE PHYSICAL ENVIRONMENT

2 credit hours

Discussion of current topics selected to acquaint the entering graduate student with a generalized view of the physical environment. Fall.

Prerequisite: Permission of instructor.

699. RESEARCH METHOD AND TECHNIQUES

2 credit hours

The study of research methods, techniques, and information sources pertinent to Landscape Architecture. Spring.

Prerequisite: Permission of instructor.



720. GRADUATE STUDIO II

4 credit hours

Twelve hours of studio per week. A multi-disciplinary approach to the solution of one or more environmental problems of concern to the landscape architect. Because of the multi-variable complexity of environmental problems, students pursuing various degree programs are invited to utilize this studio. Spring.

Prerequisite: LA 620 or permission of instructor.

721. GRADUATE STUDIO III

4 credit hours

Twelve hours of studio per week. An extension of LA 720 (Graduate Studio II) with the engagement of more advanced projects. Fall.

Prerequisite: LA 720 or permission of instructor.

730. PLANT MATERIALS IV

2 credit hours

Lecture, field work, trips. Special study of woody and herbaceous plant materials, greenhouse operation, and other horticultural practices. Spring.

731. PLANT MATERIALS

3 credit hours

Seminars, individual conferences, field trips, readings. Guided individual study in aspects of plant materials related to landscape architecture. Fall or Spring.

Prerequisite: LA 730 or permission of instructor.

740. LANDSCAPE ARCHITECTURAL CONSTRUCTION

3 credit hours

Lectures, drafting. Detailed study of special landscape construction problems. Preparation of estimates, contracts, and specifications. Fall.

Prerequisite: LA 542.

750. CITY AND REGIONAL PLANNING

3 credit hours

An introduction to methods of city and regional planning through the study of contemporary planning problems. Readings, discussions, and reports. Fall and Spring.

Prerequisite: Permission of instructor.

797. SEMINAR

2 credit hours

Two hours per week. Discussion of current topics, trends, and research related to landscape architecture, planning, and management. Fall and Spring.

Prerequisite: Permission of instructor.

798. RESEARCH PROBLEM

Credit hours to be arranged according to nature of problem

Special study of assigned problems relating to landscape architecture or planning, with emphasis on critical thinking. Fall and Spring.

Prerequisite: Permission of instructor.

799. RESEARCH TOPICS

2 credit hours

The study of research trends and current research needs pertinent to landscape architecture. During this course, the student is asked to develop a topic area and a proposed strategy for his terminal study. Fall.

Prerequisite: L A 699.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring.

MANAGEMENT (FOREST MANAGEMENT)*

201. PLANE SURVEYING

3 credit hours

Two hours of lecture and recitation, three hours of field or office practice. A comprehensive development of the theoretical principles of plane surveying. Use of modern instruments and methods, computations related to forest activities. Fall. Staff.

Prerequisite: Plane Trigonometry.

303. INTRODUCTION TO FOREST MEASUREMENTS (SUMMER FIELD SESSION)

1 credit hour

Introduction to the concepts and practices of elementary field measurements necessary to forest survey and stand data

*See also listings for Forest Engineering.

preparation. Emphasis is given to field procedures, methods, and instruments, and to recognition of need for standards of performance. Summer Session. Staff.

310. ROADS

3 credit hours

Two hours of lecture, three hours of field and laboratory practice. Engineering principles in the planning, location, design, construction, and maintenance of forest roads. Contract specifications, costs, drainage, typical sections, grades, curves, surfacing materials, use of heavy equipment, and explosives. Principles in the location, installation, and maintenance of communications. Spring. Mr. Koten.

Prerequisite: F Mgt 201 or F Engr 301.

340. HARVESTING

2 credit hours

Two hours of lecture. Principles of harvesting primary forest products. Equipment, methods, and economics of the logging industry. Spring. Mr. Koten.

498. PROBLEMS IN FOREST MANAGEMENT

1-3 credit hours

Independent study in special problems of Forest Management. The selection of a subject area will be determined by the student and an appropriate faculty member designated by the Department Chairman. A final written report is required for department records. Fall and Spring. Staff.

Prerequisites: Senior standing in Resources Management and permission of instructor.

522. MENSURATION

3 credit hours

Two hours lecture and discussion, one three-hour laboratory. Principles and methods of estimating and projecting net volumes of trees and products; tree form; timber volume determination of logs, trees and stands; growth determination; analyses by graphical and mathematical methods; stand structure adjustments; numerous problems. Spring. Mr. Sullivan.

Prerequisites: AM 571 or AM 591; F Mgt 201 or F Engr 301.

530. FOREST MANAGEMENT

4 credit hours

Three hours of lecture supplemented by one hour of discussion and/or lecture. Public and private forest policy formation; principles of modern management; over-all management and operation of a productive forest property. Primarily for forest engineers. Not available to Resource Management undergraduates. Spring or Fall. Mr. Koten.

Prerequisite: Mensuration and Silviculture or by permission of the instructor.

540. ANALYSIS AND CONTROL OF FORESTRY OPERATIONS

3 credit hours

Two hours of lecture, three hours laboratory. Applications of scientific methods to management decision problems of forestry operations with emphasis on data sources and reliability, model formulation, inventory control, equipment replacement, simulation, and critical path scheduling and costing. Fall. Mr. Koten.

Prerequisites: AM 571 or equivalent, F Mgt 340 and computer programming.

552. MANAGEMENT PLANNING AND OPERATIONS

3 credit hours

Three hours of lecture and recitation. The over-all management and operation of a forest property as a productive enterprise, particularly development and expediting of cutting budgets, work plans, and operating schedules. Emphasis is on integration of principles and concepts of mensuration, silviculture, utilization, engineering, economics, administration and human relations in the context of a practical operating land ownership. Spring. Mr. Horn.

554. FOREST ADMINISTRATION AND POLICY

3 credit hours

Three hours of lecture and recitation. Administrative and executive aspects of forestry. Public and private forest policy formulation; basic principles of organization, planning, public relations, personnel management, budget, and administrative practice. Work and organization

of the major agencies engaged in forestry. Fall. Mr. Getty.

556. MANAGEMENT OF THE FOREST BUSINESS

3 credit hours

Three hours of discussion. Overview of major business management principles and methods of operation in forestry enterprises. Emphasis is on general business concepts which forest managers must use. Actual case studies are basis of instruction. Complementary to F Econ 511. Fall or Spring. Mr. Horn.

558. THE LAW OF NATURAL RESOURCE ADMINISTRATION

3 credit hours

Three hours of lecture-discussion. An introduction to the law concerning the procedures, powers, and judicial review of public agencies responsible for the management of natural resources. Topics will include the extent of an agency's rule-making power and the rights of aggrieved parties to appeal from agency decisions. Spring. Mr. Horn.

Prerequisite: F Mgt 554 or equivalent course in public administration.

560. MANAGEMENT PRINCIPLES AND PROCESSES

3 credit hours

Three hours of lecture. The principles of the art of managing manpower, providing greater depth in the concepts of management covered in F Mgt 554. Network analysis methods of management planning. Evaluation of personnel. Human relations concepts. The processes of problem recognition and decision-making, with consideration of the philosophical and qualitative elements of management science and information theory and their implications. Spring. Staff.

Prerequisite: F Mgt 554 or permission of instructor.

561. OPERATION COST CONTROL

3 credit hours

Three hours lecture. Management uses of accounting data. Essentials of cost accounting and the uses and misuses of historical cost data in management decisionmaking. Concepts of financial

analysis of past and projected cash flows, and various methods of comparing alternatives. Fall and Spring. Staff.

Prerequisite: Permission of instructor.

562. THE STRUCTURE OF MANAGEMENT DECISIONS

3 credit hours

Three hours of lecture. Introductory course in managerial decisionmaking. Covers theory, concepts, and methodology of management practices and relates these to the realities of decisionmaking. Uses the problem solving approach in preparing the prospective resource manager or administrator for an understanding of the application of decision-making models. Spring. Staff.

Prerequisites: F Mgt 554, AM 571 or equivalent and permission of instructor.

572. PRINCIPLES OF OUTDOOR RECREATION

3 credit hours

Three hours of lecture per week. Lectures, assigned readings, oral reports. Discussion of the importance of outdoor recreation in modern society and factors which contribute to the need for outdoor recreation. Description of types of recreational facilities and the organizations which provide them. Explanation of economic, social, and political relationships in outdoor recreation. Fall. Staff.

Prerequisite: Fourth year status or permission of instructor.

575. SOCIOLOGY OF OUTDOOR RECREATION

3 credit hours

Two hours lecture, three hours laboratory. Introduction to theory and research findings dealing with the sociological aspects of outdoor recreation: field work and lectures suggest administrative applications. Spring. Staff.

Prerequisite: An introductory course in sociology or psychology; instructor's permission.

710. RESEARCH METHODS

3 credit hours

Instruction regarding methodology in the approach to and solution of problems in Forest Management research. Re-

stricted to graduate students in Forest Management. Spring. Staff.

720. TOPICS IN ADVANCED MENSURATION

3 credit hours

Two 1½ hours of lecture per week. Topics to meet students' interests are selected from the following areas: systematic, stratified and cluster sampling; ratio and regression estimates; photo interpretation and double sampling; sampling with unequal probabilities and 3P sampling; Continuous Forest Inventory (CFI) and Sampling with Partial Replacement (SPR). Introduction to Matrix Algebra and its application to Multiple Linear Regression, Weighted Least Squares Method, Volume Table Construction, and Analysis of Covariance by dummy variables. Applications of Mathematical Programming and simulation techniques to management problems involving optimization of cost functions. Fall. Mr. Cunia.

Prerequisites: F Mgt 522 and AM 591 or equivalent.

752. APPLIED FOREST MANAGEMENT

3 credit hours

Principles and practices of forest management as applied to specific forest properties under the guidance of responsible public and private foresters. Several days are spent in the field studying forest conditions, organizations, operations, and problems. By observing actual forest operations, students become acquainted with the latest and most efficient forest practices in office and forest. Fall. Mr. Horn.

754. ADVANCED FOREST ADMINISTRATION

3 credit hours

Critical appraisal of existing public, semi-public and private forestry agencies in the United States, and the comparative study of major administrative organizations and practices. Occasional inspection trips to forestry headquarters and field units and discussion of internal administrative problems with forest officers. Spring. Mr. Getty.

Prerequisite: F Mgt 554 or equivalent.

756. MANAGEMENT CONCEPTS IN PLANNING FOREST PRODUCTION

3 credit hours

Three hours of lecture-discussion. The theories and principles involved in planning the annual allowable cut and the resulting yearly cutting schedules. The influence of technical decision and socioeconomic pressures upon the level of cutting and the effect of the level of cutting upon the dependent industry. Fall or Spring. Mr. Koten.

Prerequisite: F Mgt 552 or equivalent.

797. SEMINAR

1 credit hour

Group discussion and individual conference concerning current topics, trends, and research in management. Fall and Spring. Staff.

798. FOREST MANAGEMENT PROBLEMS

Credit hours arranged according to nature of problem

Hours to be arranged. Special study of assigned problems with emphasis on critical thinking. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

851. OPERATIONS RESEARCH I

3 credit hours

Two 1½ hours of lecture. Stochastic or models applicable to managerial process or systems analysis. Elements of probability theory, theory of games and decision theory, queuing model, simulation techniques with applications to queuing and inventory problems, and, if time permits, Markov chains. Fall. Mr. Cunia.

Prerequisites: AM 591 and Math 227 or equivalent.

852. OPERATIONS RESEARCH II

3 credit hours

Two 1½ hours of lecture. Deterministic or models applicable to managerial problems or systems analysis. Elements of Matrix Algebra, solving simultaneous linear equations, mathematical programming, classical optimization techniques, LaGrange multipliers. Linear programming transportation and allocation models, dynamic programming, network

analysis and, if time permits, quadratic, parametric and integer programming. Fall. Mr. Cunia.

Prerequisites: AM 591 and Math 277 or equivalent.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

MATHEMATICS (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSES)

115. PLANE TRIGONOMETRY

3 credit hours

Three hours of lecture. The course includes: the six trigonometric functions, the radian measure of angles, the variation and graphs of the trigonometric functions, the solution of right triangles and applications, trigonometric identities, trigonometric equations, inverse trigonometric functions, the general triangle, complex numbers, logarithms, and accuracy of computed results. Fall or Spring. Mr. Green.

116. COLLEGE ALGEBRA

3 credit hours

Three hours of lecture. The course includes a review of the axioms of algebra, the algebraic operations, inequalities, functions and their graphical representation, linear and quadratic functions, determinants, theory of equations, inverse functions, permutations, combinations and probability, the Binomial Theorem, mathematical induction, exponential and logarithmic functions and complex numbers. Fall or Spring. Mr. Green.

PAPER SCIENCE AND ENGINEERING

300. INTRODUCTION TO THE PULP AND PAPER INDUSTRY

3 credit hours

Discussion of the historical modern development and management of the paper industry. Fall. Mr. O'Neil.

301. PULP AND PAPER PROCESSES

3 credit hours

Three hours of lecture. Introduction to pulp and paper technology with emphasis on pulping and bleaching. A study of the processes of pulping and bleaching of fibers including underlying theory. An introduction to formation and reactions of a fibrous web. Spring. Mr. Bambacht.

Prerequisites: Chem 332, F Chem 575 and 576.

302. PAPER PROCESSES LABORATORY

1 credit hour

One three-hour laboratory. Study and practice in the techniques of laboratory procedures normally encountered in the pulp and paper industry. Laboratory exercises selecting and using standard testing methods. Field trips to observe commercial equipment of the pulp and paper industry. Spring. Mr. Bambacht.

Prerequisite: PSE 301 (or concurrent).

304. MILL EXPERIENCE

5 credit hours

Twelve weeks full-time pulp or paper mill employment approved by the Department between the junior and senior years. Ordinarily, the student receives wages or salary while getting the required experience. The student must submit a comprehensive report to fulfill this requirement. An adaptability rating chart furnished by the Department is prepared by the mill for each student employed. Staff.

305. MILL INSPECTION REPORT

1 credit hour

One week inspection trip to representative manufacturers of pulp and paper, papermaking equipment, plastics, chemicals, or related products selected for demonstrating typical plant scale operations. Ultimate emphasis is on manufacture of pulp and paper. Daily discussions.

Typewritten report required on termination of trip. Trip expenses are approximately \$60 per student. Spring. Staff.

Prerequisites or concurrent: PSE 301, PSE 302, PSE 570, PSE 571, and PSE 573.

496. SPECIAL TOPICS

1-3 credit hours

Lectures, conferences, and discussions. Specialized topics in chemistry, chemical engineering, and physics as well as topics pertaining to management as related to the pulp, paper, paperboard and allied industries. Spring. Staff.

498. RESEARCH PROBLEM

4 credit hours

Twelve hours laboratory. The student is assigned a research problem in pulping, bleaching, refining, additives, quality control of paper or paper products or chemical engineering. The student must make a systematic survey of available literature on the assigned problem. Emphasis is on application of correct research technique rather than on discovery of results of commercial importance. The information obtained in the literature survey along with the data developed as a result of the investigation is assembled and evaluated and submitted in duplicate to his instructor. Spring. Staff.

Prerequisites: PSE 561, PSE 565.

556. ECONOMICS OF PULP AND PAPER

2 or 3 credit hours

Two or three hours of lecture and seminar. Structure and development of the industry and the decisions of management are explained in the light of economic principles. Current industrial trends and problems are discussed. Each student prepares an analytical report on some aspect of industry structure. Spring. Mr. Armstrong.

Prerequisite: F Econ 290 or equivalent.

561. PULPING TECHNOLOGY

4 credit hours

Two hours of lecture and six hours of laboratory. Discussion of pulping and bleaching processes: Effect of chemicals and physical variables on the wood components and pulp properties; chemistry

involved. Experiments in pulping and bleaching, and pulp evaluation. Fall. Mr. Gorbatsevich.

Prerequisites: PSE 570, Chem 346 and Chem 356.

Note: A student may not enroll in or receive credit for both PSE 561 and PSE 661.

565. PAPER PROPERTIES

5 credit hours

Three hours of lecture, six hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results, and the ultimate properties desired in the finished paper. Fall. Mr. Strauss.

Prerequisites: PSE 301, PSE 302.

Note: A student may not enroll in or receive credit for both PSE 565 and PSE 665.

566. PAPER COATING

3 credit hours

Two hours of lecture, three hours of laboratory. Evaluation and study of the various coating processes and materials used by the paper industry to impart special properties to paper. Relationships of various components, flow properties of coating mixtures, and evaluation of their effect on coated paper properties will be studied. Spring. Mr. Strauss.

Prerequisite: PSE 565.

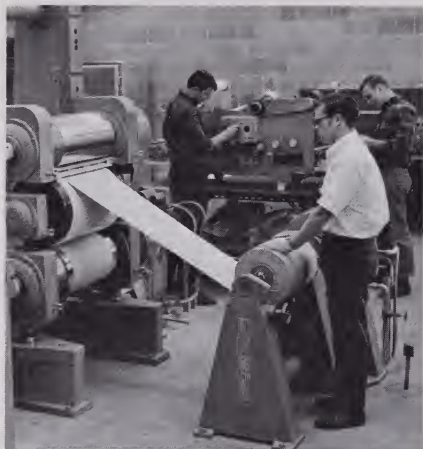
Note: A student may not enroll in or receive credit for both PSE 566 and PSE 666.

568. PAPERMAKING PROCESSES

3 credit hours

One hour of lecture, six hours of laboratory. Laboratory study of the papermaking process, with emphasis on operation of the semi-commercial Fourdrinier paper machine. Emphasis is on the fundamentals of stock preparation, paper machine operation, evaluation of the finished product, and the collection and analysis of data to develop material and energy balance. Results of each paper machine run are evaluated in seminar-type discussions. Spring. Messrs. Strauss, Gorbatsevich, and Stenuf.

Prerequisites: PSE 561, PSE 565, PSE 571.



570. PRINCIPLES OF MASS AND ENERGY BALANCE

3 credit hours

Three hours of lecture. Study of the properties of steam and solving problems connected with material and energy balances. Spring. Mr. Gorbatsevich.

Prerequisites or concurrent: Math 227, Physics, Chem 346, Chem 356, and Chem 333.

572. PULP AND PAPER UNIT OPERATIONS LABORATORY I

1 credit hour

Three hours of laboratory. Laboratory study of fluid dynamics, heat transfer and evaporation. Emphasis is placed on the recognition of the important variables and on methods of evaluating them by experimentation and subsequent calculations. Specially designed semi-commercial equipment is used. Fall. Mr. Stenuf.

Concurrent: PSE 571.

574. PULP AND PAPER UNIT OPERATIONS LABORATORY II

3 credit hours

Nine hours of laboratory. Laboratory study of humidity and air conditioning, drying, extraction, distillation, gas absorption, filtration, sedimentation, mixing, and other unit operations. Emphasis is placed on the recognition of the important variables and on methods of evaluating them by experimentation and

subsequent calculation. Specially designed semi-commercial equipment is used. Spring. Mr. Stenuf.

Concurrent: PSE 573.

575. UNIT OPERATIONS I: FLUID MECHANICS AND HEAT TRANSFER

3 credit hours

Three hours of lecture and four hours of recitation per week for the first 9 weeks of the semester. The study of momentum and heat transfer. Pipeline and duct design, pump and blower selection, flow measurement, open channel flow, heat transfer by conduction, convection, radiation, including equipment design and selection. Fall. Mr. Stenuf.

Prerequisites: F Chem 221 and 223, Chem 106, 116, 346, 356, Phys 103, 104, PSE 300, 301, 570 or equivalents.

576. UNIT OPERATIONS II: PROCESS CONTROL AND MASS TRANSFER

2 credit hours

Two hours of lecture and four hours of recitation per week for the last 6 weeks of the semester. The study and application of measuring means, remote signal transmission, and control elements. Response to signals, lag, dynamic error, cycling and other phenomena of process control are discussed in relation to the standard modes of control, including two-position, single-speed floating, proportional, proportional-speed floating, proportional-reset, proportional-reset-rate, cascade control, relation of the process variables to open and closed loop computer applications.

The fundamentals of mass transfer, humidification and air conditioning as applied to industry and as found in the environment—climate and weather conditions. Fall. Mr. Stenuf.

578. UNIT OPERATIONS III: MASS TRANSFER

3 credit hours

Three hours of lecture and four hours of recitation per week for the first 9 weeks of the semester. The study of mass transfer and application to the design and operation of equipment for drying, gas absorption, distillation and extrac-

tion. Each operation is treated as a practical unit complete with application of heat transfer, fluid flow, thermodynamics and instrumentation. Spring. Mr. Stenuf.
Prerequisite: PSE 576.

579. UNIT OPERATIONS IV RECOVERY PROCESSES OPERATIONS

2 credit hours
Three hours of lecture and four hours of recitation per week for the last 6 weeks of the semester. The study of industrial recovery processes operations including evaporation, filtration, sedimentation, centrifugation, small particle technology and fluidization, and reverse osmosis. Each operation is treated as a practical unit complete with application of heat transfer, fluid flow, thermodynamics and instrumentation. Spring. Mr. Stenuf.

Prerequisite: PSE 576.

661. PULPING TECHNOLOGY

4 credit hours
Two hours of lecture and six hours of laboratory. Discussion of pulping and bleaching processes. Effects of chemicals and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall. Mr. Gorbatsevich.

Prerequisites: PSE 570, Chem 346 and Chem 356.

Note: A student may not enroll in or receive credit for both PSE 561 and PSE 661.

665. PAPER PROPERTIES

5 credit hours
Three hours of lecture, six hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results, and the ultimate properties desired in the finished paper. Fall. Mr. Strauss.

Note: A student may not enroll in or receive credit for both PSE 565 and PSE 665.

666. PAPER COATING

3 credit hours
Two hours of lecture, three hours of laboratory. Evaluation and study of the various coating processes and materials used by the paper industry to impart special properties to paper. Relationships of various components, flow properties of coating mixtures, and evaluation of their effect on coated paper properties will be studied. Spring. Mr. Strauss.

Note: A student may not enroll in or receive credit for both PSE 566 and PSE 666.

775. INDUSTRIAL THERMODYNAMICS

3 credit hours
The study and application of thermodynamics, including the first and second law, phase relationships, thermochemistry, the production of work and equilibrium relationships. Fall. Mr. Stenuf. Course given in even calendar years.

Prerequisites: Chem 346, Chem 356, or equivalent.

778. METALLURGY AND CORROSION FOR THE PAPER INDUSTRY

3 credit hours
Three hours of lecture. The study and application of metallurgy and corrosion for the Pulp and Paper Industries. Fall. Mr. Stenuf. Course given in odd calendar years.

Prerequisites: Chem 346, Chem 356, or equivalent.

796. SPECIAL TOPICS

1-3 credit hours
Lectures, conferences, and discussions. Advanced topics in chemical engineering, chemistry and physics as related to fibers, pulps, and paper. Fall and Spring. Staff.

797. SEMINAR

1 credit hour
Discussions of assigned topics in fields related to pulp and paper technology. Fall and Spring. Staff.

798. RESEARCH IN PULP AND PAPER TECHNOLOGY

Credit hours arranged according to nature of problem
Hours to be arranged. Problems in pulp and paper technology are assigned

to properly qualified graduate students. One typewritten report (original and one carbon) required. Fall and Spring. Staff. Prerequisites depend upon nature of problem.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

RESOURCES MANAGEMENT

304. SILVICULTURE—RESOURCE MANAGEMENT (SUMMER FIELD SESSION)

3 credit hours

Field exercises designed to illustrate silviculture practices applied to forest stands, followed by a sequence of field trips, case studies and discussions introducing concepts and applications of multiple use in forestry. Consideration of the effects of ownership, forest conditions, economic factors and achieving management objectives. Summer Session Staff.

341. SOIL AND WATER CONSERVATION

3 credit hours

Three lectures per week. An integrated historical survey of water and related land resource conservation in the United States. Interrelationships of planning, administration, and evaluation of policies, programs, and projects by all levels of government and private units. Spring. Mr. Black.

497. RESOURCES MANAGEMENT SEMINAR

3 credit hours

Three hours of group discussion and analysis. Current literature, plans, and principles, and new developments in forest management. Fall or Spring. Staff.

502. RESOURCES MANAGEMENT

3 credit hours

The interrelationships between man and forest resources and the multiple services which those resources provide; the extent and nature of responsibilities of the forester to the community and to society in his stewardship of natural resources. Spring. Staff.

529. ENVIRONMENTAL IMPACT: PRINCIPLES AND STRATEGY

3 credit hours

Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by Federal Law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution before various governmental levels. Means of obtaining and sources of authoritative information. Spring. Messrs. Black, Herrington and Staff.

Prerequisite: Senior standing.

641. SOIL AND WATER CONSERVATION

3 credit hours

Three hours of lecture and discussion. An integrated examination of the many aspects of the field of water and related land resource conservation in the United States. Topics include the evaluation and present status of planning, organizational, economic, and legal constraints on the development of policies and programs of the Federal agencies, state and local government, and private units. Fall. Mr. Black.

Prerequisite: Permission of the instructor.

642. WATER QUALITY MANAGEMENT

3 credit hours

Three hours of lecture and seminar per week. The review of the ethical, historical, legal and technical basis for water quality management. Investigation of public policy on the international, federal, state and local levels and the administrative methods and programs used to implement policy. Fall. Mr. Hennigan.

643. URBAN WATER MANAGEMENT

3 credit hours

Three hours of lecture and seminar per week. A review of the role of urban water management in water resources management. The problems and issues of providing water utilities services of water supply, drainage and waste water facilities including such considerations as planning, financing, local government, intergovernmental relations, state and federal role, water institutions and applicable law. Spring. Mr. Hennigan.

798. RESEARCH PROBLEMS IN RESOURCES MANAGEMENT

Credit hours arranged according to nature of problem

Special investigation and analysis of resources management problems where integrative relationships of several subject aspects of forestry are a major consideration. Fall and Spring. Staff.

SILVICULTURE

302. SILVICS (SUMMER FIELD SESSION)

1 credit hour

Dynamics of forest development; the species and their several characteristics—including tolerance, growth, survival, and patterns of reproduction; species interrelationships; successional trends—effects on forest stand structure. Observation of forest responses following natural catastrophe, logging, clearing, or fire. Introduction to principles of forest cover manipulation by man. Mr. Berglund and Mr. Johnson.

324. GENERAL SILVICULTURE

3 credit hours

Three hours of lecture per week for first half of semester; two hours of lecture and three hours of laboratory or field work per week during second half of semester. Presentation of silvicultural concepts, principles, and practices. Not designed for biology or resource management majors. Spring. Mr. Lea.

Prerequisite: Junior standing.

332. SOILS

3 credit hours

Two hours of lecture and three hours of laboratory. Introduction to the fun-

damentals of soil science with particular reference to forestry, but including other land uses. Fall. Mr. Craul.

351. METEOROLOGY AND FIRE BEHAVIOR

3 credit hours

Lectures and recitations in atmospheric physics and the physics and chemistry of combustion lead to discussions of fire behavior and the strategy and tactics of fire suppression. Fall. Mr. Herrington.

Prerequisite: Physics 103 and 104 (Calculus helpful but not required).

497. SILVICULTURE SEMINAR

2 or 3 credit hours

Group study of selected silvicultural problems or situations of mutual interest. Emphasis is on critical evaluation and analysis and on organization and presentation of results from individual study for group consideration. Spring. Staff.

498. SPECIAL STUDIES IN SILVICULTURE

1-3 credit hours

Independent research in silviculture for selected undergraduate students. Selection of subject areas determined by the student in conference with appropriate faculty member. Final written report is required for departmental record. Fall or Spring. Staff.

Prerequisite: Consent of instructor and department chairman.

520. APPLICATION OF ECOLOGY

3 credit hours

Two hours lecture and discussion and one to three hours seminar, laboratory or field trip per week. Examination of ecological concepts relevant to practices modifying terrestrial ecosystems for human benefit. Discussion of selected ecological literature, seminars, and field trips by specialists in various fields of applied ecology, and student presentations exploring ecological implications of specific problems or situations. Course designed for interdisciplinary participation. Spring or Fall. Mr. Richards.

Prerequisites: An ecology course or permission of instructor. Senior standing desirable.

521. PRINCIPLES OF SILVICULTURE

3 credit hours

Three hours of lecture during the first half of the semester; two hours of lecture and three hours of laboratory during the second half of the semester. The forest as a community. Site factors and forest stand dynamics. Introduction to manipulation of forest cover to meet objectives of forest owners. Spring. Mr. Berglund.

Prerequisites: Summer Session in Field Forestry, F Bot 330 or F Bot 530 concurrently, or permission of instructor.

524. PRACTICES OF SILVICULTURE

3 credit hours

Two hours of lecture and one three-hour laboratory or field trip. Theory and practices of silviculture manipulation of forest stands to gain objectives of the forest owner. Emphasis is on thinning, reproduction cuttings, plantings, and other silvicultural operations in their relationships to economic and ecological factors. Fall. Mr. Johnson.

Prerequisite: Silvi 521 or permission of the instructor.

525. ADVANCED PRACTICES OF SILVICULTURE

3 credit hours

Four hours of lecture and seminar during the first half of the semester; six hours of field exercises thereafter. Development of silvicultural decisions in management of woodlands. Trips to forest areas. A cultural plan prepared to attain assigned objectives. Spring. Mr. Lea.

Prerequisite: Silvi 524.

528. REGIONAL STUDIES

2 credit hours

Two hours of lecture. Study and analysis of the many factors that influence the silvicultural management of the important tree species of North America. These factors include importance of forest and forestry to a designated region, physiography, geology, soils, climate and weather, sites and site types, ecology, problems of protection and silvical characteristics of the more important species. Spring. Mr. Johnson.

Prerequisite: Silvi 524.

535. FOREST SOILS

3 credit hours

One hour of lecture, one hour of discussion, four hours of laboratory, field study of forest soils. Effect of silvicultural operations on soil. Selection of tree species for planting on different soils. Tree growth and development—soil properties relationships. Methods of soil sampling and laboratory analysis. Fall. Mr. Leaf.

Prerequisite: Silvi 332.

540. FOREST HYDROLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. The relation of forest and range vegetation to its environment, and its effect upon soil and water. Measurement of precipitation, runoff, erosion, and other variables. Fall and Spring. Mr. Eschner and Mr. Black.

542. PRACTICE OF WATERSHED MANAGEMENT

3 credit hours

Two hours of lecture, three hours of laboratory. The impact of the multiple use of forest and range lands on water yield and soil stability. Regional problems and potential solutions. Spring. Mr. Eschner.

Prerequisite: Silvi 540.

552. GENERAL METEOROLOGY

3 credit hours

Three hours of lecture. Examination of the physical processes of the atmosphere as they relate to the exchange of heat, moisture, and momentum in the earth-atmosphere system. Emphasis on the meteorological and micrometeorological basis of climate and its interaction with the biological world. Spring. Mr. Herrington.

Prerequisite: Junior standing or permission of instructor.

553. METEOROLOGY LABORATORY

1 credit hour

Three hours laboratory. An extension of Silvi 552 which provides analysis and discussion of the atmospheric processes important to weather and climate. Major topics include air mass analysis, surface weather map analysis, and climatological

summarization procedures. Spring. Mr. Herrington.

Prerequisites: Silvi 552 or concurrently and permission of instructor.

577. FOREST TREE IMPROVEMENT *3 credit hours*

Two hours of lecture, three hours of laboratory or field work. General principles and methods of tree improvement practiced in this country and abroad. Tree selection, techniques of vegetative propagation, hybridization, polyploidy, establishment of seed orchards, clonal and offspring testing and other problems. Spring. Mr. Westfall.

Prerequisites: F Biol 571 and 572 strongly advised.

625. PRODUCTIVITY OF FOREST STANDS *3 credit hours*

Examination of forest tree and stand production variables as related to silvicultural manipulation. Analysis of stand response, such as rate of growth, stem form, product quality, tree value, and value. Preparation of stand treatment schedules. Spring. Mr. Richards and Mr. Johnson.

Prerequisite: Permission of instructor.

640. ADVANCED WILDLAND HYDROLOGY *3 credit hours*

Lecture, discussion, and laboratory sessions in advanced problems of forest and range hydrology, watershed management methods and techniques, and evaluation of new methods of hydrologic data collection and analysis. Fall. Mr. Black.

Prerequisites: Silvi 540 or F Engr 340.

641. WATERSHED ANALYSIS *3 credit hours*

One hour of lecture and six hours of laboratory each week. Lecture and field experience in watershed characterization, inventory, and analysis in terms of land management problems. Fall. Mr. Black.

Prerequisites: Silvi 540 and permission of instructor.

642. SNOW HYDROLOGY *3 credit hours*

Three one-hour lectures per week and two three-day field trips. Physical char-

acteristics of snow and the energy relations important in its accumulation and dissipation. Problems of measurement and prediction of runoff and melt. Potentials for management. Spring. Mr. Eschner.

Prerequisite: Silvi 540 or F Engr 340.

650. ENERGY EXCHANGE AT THE EARTH'S SURFACE *3 credit hours*

Two hours lecture and three hours of laboratory. A comprehensive study of the physical processes taking place in the lowest layer of the atmosphere. Primary emphasis on the turbulent transfer of heat, momentum, and water vapor and the expression of these fluxes in the microclimate. Spring. Mr. Herrington.

Prerequisite: Silvi 552, physics, and calculus.

677. ADVANCED FOREST TREE IMPROVEMENT *3 credit hours*

Two hours lecture and discussion, three hours laboratory. A study of advanced principles and techniques for genetic improvement of forest trees. Special emphasis is placed on selection and breeding for growth rates, wood quality, and insect and disease resistance. Problems of tree hybridization, racial variations, sexual reproduction, and quantitative genetics in forest trees. Laboratory training in cytology and cytogenetics, pollen germination, vegetative propagation and other problems. Independent research problems will be undertaken by the student. Fall or Spring. Mr. Westfall.

Prerequisites: F Biol 571 and 572, Silvi 577.

730. RESEARCH METHODS IN SILVICULTURE *3 credit hours*

Three hours of lecture or discussion. Research concepts and methodology with particular application to silviculture and its related sciences. More appropriate to beginning students or before taking thesis work. Fall. Staff.

Prerequisite: Permission of instructor.

**735. FOREST SOIL FERTILITY
(APPLIED STUDIES)**

2-4 credit hours

Two hours of lecture, one hour of discussion. None to six hours of laboratory depending on number of credit hours. Influence of soil fertility on development and growth of seedlings and trees, and techniques involved to determine this influence. Chemical and biological analysis to determine levels of soil fertility. Nutrient element deficiencies and their correction by soil amendments and fertilizers. Term projects by the student will be undertaken. Spring. Mr. Leaf.

Prerequisites: Chem 332 and 333, F Bot 530, Silvi 535, or equivalent.

737. FOREST SOIL PHYSICS

4 credit hours

Three hours of lecture and discussion and three hours of laboratory. Presentation of principles of soil physics including water flow, storage and availability, soil permeability, heat transfer, and their consideration as root environmental factors. Analytical procedures are introduced and evaluated. Applications of soil physics to silvics, soil fertility, watershed management and hydrology, soil biology and land-use. Spring. Mr. Craul.

Prerequisites: Silvi 332, 535, or their equivalents. Physical chemistry and integral calculus strongly recommended.

**777. QUANTITATIVE GENETICS IN
FOREST TREE IMPROVEMENT**

3 credit hours

Two-hour lecture and discussion, three hours laboratory. Development of statistical models for determining heritability in forest trees. Breeding models and computer analysis application in forest genetics. Fall or Spring. Mr. Westfall.

**797. GRADUATE SILVICULTURE
SEMINAR**

1 credit hour

Three-hour class discussion per week. Assigned reports and discussion of silvicultural topics. Fall and Spring. Staff.

**798. RESEARCH PROBLEMS IN
SILVICULTURE**

*Credit hours arranged according
to nature of problem*

Hours to be arranged. Fall and Spring. Staff.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

WOOD PRODUCTS ENGINEERING

**300. PROPERTIES OF WOOD
FOR DESIGNERS**

2 credit hours

Two hours of lecture. An introduction to the basic structure and properties of wood for the designer. Discussion of the effects of wood structure and properties on practical woodworking techniques. Fall. Staff.

**304. INTRODUCTION TO
FOREST PRODUCTS**

2 credit hours

Two hours of lecture. Characteristics of the products of the forest tree and manufacture of wood products. Fall. Mr. E. Anderson.

322. MECHANICAL PROCESSING

3 credit hours

Two hours of lecture, three hours of laboratory. Primary log reduction methods and industry practices. Lumber grading. Wood cutting principles. Machining practice in secondary wood-using industries. Experience in the operation of certain primary and secondary machining equipment. Fall. Mr. Moore.

390. FIELD TRIP

2 credit hours

Two weeks supervised study and reporting of representative wood products industries. Spring. Staff. Required of all students in WPE. Estimated individual expenses are \$100-150 while on the trip.

**402. ELEMENTARY TIMBER
MECHANICS**

3 credit hours

Two hours of lecture, three hours of laboratory. Introduction to strength

properties of wood, and wood products and other construction materials. Applications of these materials in typical construction problems. Fall. Mr. Kyanka.

Prerequisite: Senior standing or permission of instructor.

442. LIGHT CONSTRUCTION

3 credit hours

Two hours of lecture, three hours of laboratory. Elements of light frame construction, blueprint reading, and estimating. Fall. Mr. G. Smith.

486. ELEMENTARY WOOD TECHNOLOGY

2 credit hours

One hour of lecture, three hours of laboratory. Structure of wood in relation to defects, properties and uses. The variability of wood. Identification of major commercial U.S. timber by gross feature. Spring. Mr. deZeeuw and Staff.

487. WOOD STRUCTURE AND PROPERTIES

4 credit hours

Two hours of lecture, six hours of laboratory. Identification variability and anatomical characteristics of wood and papermaking fibers. Uses, properties and sources of wood and fibers. Structure of wood in relation to defects, properties, and uses. Fall. Mr. deZeeuw and Staff.

Prerequisite: F Bot 100 or consent of instructor.

497. SENIOR SEMINAR FOR WOOD PRODUCTS ENGINEERING MAJORS

2 credit hours

Discussion and assigned reports in current problems and new developments in wood products engineering. Fall. Staff.

498. RESEARCH OR DESIGN PROBLEM

1-3 credit hours

Conferences, library, laboratory, and/or field research on a specific problem in wood products engineering. Typewritten report (original and one copy) required. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

502. TIMBER MECHANICS

4 credit hours

Three hours of lecture and three hours of laboratory second semester. Mechanical properties of wood and elements of structures. Lectures, problems, and use of timber-testing equipment. Spring. Mr. Kyanka.

Prerequisites: Calculus, physics.

504. DESIGN OF WOOD STRUCTURAL ELEMENTS

3 credit hours

Lectures plus laboratory exercises. A development of the principles involved in designing structural elements in wood and practice in their application. Fall. Mr. Kyanka.

Prerequisite: WPE 502.

520. POLYMERIC ADHESIVES AND COATINGS

3 credit hours

Two hours of lecture, three hours of laboratory. Physical and chemical properties of organic adhesives and surface coatings. Evaluation of application methods and performance on substrates. Spring. Mr. L. Smith.

Prerequisite: Junior standing.

522. COMPOSITE MATERIALS

3 credit hours

Two hours of lecture, three hours of laboratory. Manufacturing methods and physical properties of wood laminates, fiberboard, particleboard, plywood, paper overlays, sandwich materials, wood-polymer composites, and extruded and molded products. Fall. Mr. Moore.

Prerequisites: WPE 520, and WPE 526. Concurrent or prior registration in WPE 502 or 402.

526. FLUID TREATMENTS

2-3 credit hours

Two hours of lecture (2 credit hours), three hours of laboratory (1 credit hour). Steady-state and unsteady-state flow of liquids, gases, water vapor, and heat as related to wood structure. Wood preservative and fire-retardant treatments. Laboratory studies in permeability measurement, impregnation of wood with

liquids, dry kiln operation, and wood preservation. Spring. Mr. Siau.

Prerequisites: WPE 487 and WPE 322 (WPE 322 waived when only lecture is taken).

544. MATERIALS MARKETING

3 credit hours

Three hours of lecture and discussion. Marketing functions, agencies, and management in the wood products and related industries. Principles of salesmanship and their application. Spring. Mr. G. Smith.

550. CONSTRUCTION EQUIPMENT

3 credit hours

Three hours lecture. Principles of selection, operation, and maintenance of construction equipment. Primary types of site preparation, handling and assembly devices and their efficient utilization will be examined. Spring. Mr. Kyanka.

Prerequisite: Senior standing.

554. CONSTRUCTION MANAGEMENT

3 credit hours

Two hours lecture, three hours of laboratory. Conception, management, and control of the construction process with emphasis on specifications, costs, legal boundaries, erection planning and control, inspection and supervision. Spring. Mr. Whitt.

Prerequisite: Senior standing.

566. WOOD-WATER RELATIONSHIPS

3 credit hours

Two hours of lecture, three hours of laboratory. Consideration of basic wood-water relationships and the drying of lumber and other wood products. Fall. Mr. Skaar.

Prerequisites: Physics, calculus, WPE 526 or equivalent.

570. PRODUCTION SYSTEMS I: ANALYSIS

3 credit hours

Two hours of lecture, three hours of laboratory. Elements of system engineering. Analysis of performance characteristics of integrated production systems. Analysis of long-range vs. short-range system planning. A comprehensive lab

problem is commenced which deals with the analysis prerequisite to the establishment of a manufacturing plant in a wood-processing industry. Fall. Mr. Whitt.

Prerequisites: Senior status and IE 548, AM 591, and concurrent registration in IE 575 or equivalent.

572. PRODUCTION SYSTEMS II: SYNTHESIS

3 credit hours

Two hours of lecture and three hours of laboratory. Organization for production. Manufacturing engineering and production planning and control. Plant layout and materials handling. A comprehensive problem of production system synthesis is carried out in a succession of lab exercises oriented toward a wood-processing industry. Spring. Mr. Whitt.

Prerequisite: WPE 570 or equivalent.

585. MICROTECHNIQUE AND PHOTOMICROGRAPHY

3 credit hours

One lecture and demonstration laboratory, one laboratory. Preparation of plant and animal tissue for sectioning. Techniques of embedding, sectioning, staining and mounting. Photography through the microscope. Film and print processing. Theory of the light microscope and brief introduction to electron microscopy. Fall. Mr. Côté.

Prerequisites: WPE 486 or WPE 487, and organic chemistry.

588. COMMERCIAL TIMBERS OF THE WORLD

3 credit hours

One hour of lecture, one hour of conference, three hours of laboratory, and assigned reading. Important commercial timbers of the world, their structure, physical properties, identification, supply and uses. Spring. Mr. deZeeuw.

Prerequisite: WPE 487.

596. SPECIAL TOPICS

1-3 credit hours

Lectures, conferences, discussions, recitations, problems, and laboratory. Special topics in wood products engineering: continuations, expansions, studies in depth, and new contemporary subject areas of concern to science or practice

of wood products engineering. Fall and/or Spring. Staff.

Prerequisite: Consent of instructor.

702. ELASTICITY OF WOOD AND PLYWOOD

3 credit hours

Theory of elasticity as applied to solid and laminated wood, sandwich material, and plywood. Elements of wood plasticity. Spring. Mr. Davidson.

Prerequisites: WPE 502, Physics 203, and Physics 204.

796. ADVANCED TOPICS

2 or 3 credit hours

Lectures, conferences, discussions, and laboratory. Advanced topics in wood products engineering, including advanced studies in one or more of the basic areas covered in other courses in wood products engineering. Fall or Spring. Staff.

Prerequisite: Consent of instructor.

797. WOOD PRODUCTS ENGINEERING SEMINAR

2 or 3 credit hours

Conference, discussion and reports analyzing current research and new developments, new literature and subject matter surveys in wood products engineering. Fall and Spring. Staff.

798. RESEARCH IN WOOD PRODUCTS ENGINEERING

Credit hours arranged according to nature of problem

Investigations on directed study in wood products engineering including manufacturing, marketing, anatomy, physics, quality, and mechanical properties of wood. One typewritten report (original and one carbon) required. Fall and Spring. Staff.

860. ADVANCED WOOD PHYSICS

3 credit hours

Three hours of lecture. The physics of wood and wood-base materials. Treatment of wood-moisture relations with emphasis on movement of liquids and heat through wood. Derivation of the diffusion equations and their application to wood-treating and wood-drying processes. Spring. Mr. Skaar.

Prerequisites: WPE 566, Math 585.

880. INTERPRETATION OF CELLULAR ULTRASTRUCTURE

2 credit hours

One hour of lecture, two hours of demonstration and discussion. The organization and sculpturing of the walls of plant cells; the cellulose microfibril, matrix and incrusting substances, and the warty layer. The ultrastructure and general function of cytoplasmic organelles in cells. The tools and techniques used for light and electron microscopic study of cells, and the interpretation of structural evidence. Directed study and discussion of the latest (current) literature on pertinent topics. Spring. Mr. Côté.

Prerequisite: Permission of the instructor.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

FOREST ZOOLOGY*

100. GENERAL ZOOLOGY

4 credit hours

Prerequisite: to all other courses in Forest Zoology. An auto-tutorial course with two hours of lecture and recitation, four hours in the learning center. A brief survey of major phyla with emphasis on morphology, taxonomy, evolution, and ecology followed by an introduction to the processes of maintenance, perpetuation, and adaptation by animal species. The importance of other animals to man and the ecosystem is emphasized. Spring. Mr. VanDruff.

200. WILDLIFE CONSERVATION

3 credit hours

Two hours of lecture, one hour of recitation. Introduction to the biological principles of conservation including the

*See also listings for Forest Biology.

relationship of natural resources to modern society. The wildlife resource and its conservation will be emphasized. It is not designed for students concentrating in the area of Forest Wildlife Management. Fall. Mr. Payne.

Prerequisite: One semester of biological science.

511. INVERTEBRATE ZOOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Structure, classification and evolution of invertebrates. Emphasis on role of specific invertebrates in their natural habitat. Spring. Mr. Dindal.

512. VERTEBRATE TAXONOMY

3 credit hours

Two hours of lecture, three hours of laboratory. Identification and classification of vertebrates of central New York. Included are the principles of taxonomy, evolution, and distribution, collection procedures, and the use of field keys. Spring. Mr. Alexander.

516. ICHTHYOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. An introduction to the anatomy, physiology, ecology, behavior, and taxonomy of fishes. Spring. Mr. Werner.

520. TERRESTRIAL COMMUNITY ECOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. Relations of terrestrial animals to their physical, chemical, and biological environment. Emphasis on community principles, succession and terrestrial adaptations. Fall. Mr. Dindal.

Prerequisite: A course in basic ecology.

523. INVERTEBRATE ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 423.

Two full days/week for four weeks. Study of terrestrial invertebrate microcommunities; descriptive and comparative assay of microhabitats incorporating experimental and field techniques. Summer Session I, Cranberry Lake Biological Station. Mr. Dindal, College of Environmental Science and Forestry.

Prerequisites: General biology, general

ecology; invertebrate zoology is recommended.

524. VERTEBRATE ECOLOGY

2 credit hours

Note: SUNY, Albany No. BIO 425.

Two full days/week for four weeks. Utilization of unique Adirondack forms and communities to study population dynamics, behavior, systematics, and ecological role of vertebrates; standard field and laboratory techniques. Summer Session II, Cranberry Lake Biological Station. Staff, SUNYA.

Prerequisite: 12 hours of biology.

525. LIMNOLOGY

3 credit hours

Two hours of lecture, and either three hours of laboratory or one hour of discussion per week. An introduction to the ecology of inland waters. Particular emphasis is placed on the aquatic environment as a habitat and the effect of changes in this environment on the structure and function of the biological communities contained therein. Fall. Mr. Werner.

526. ECOLOGY OF ADIRONDACK FISHES

2 credit hours

Cranberry Lake Biological Station, Session II, every third summer. Half time for four weeks. Study of the ecology of fishes, with detailed individual investigation of the ecology of Adirondack fishes. Mr. Werner.

Prerequisite: F Zool 516.

528. VERTEBRATE POPULATION ECOLOGY

3 credit hours

Two hours of lecture and one three-hour laboratory per week. Fundamental parameters of population structure and change with emphasis on vertebrate species. Fall. Mr. VanDruff.

Prerequisite: A course in general ecology.

530. ANIMAL PHYSIOLOGY

3 credit hours

Three hours lecture. Principles of digestion, circulation, respiration, excretion, physiologic defense mechanisms, muscle contraction, electrophysiology, neural and endocrinologic regulation,

and reproduction. Spring. Mr. Hartenstein.

540. FISHERY BIOLOGY

2 credit hours

One hour of lecture, three hours of laboratory. Principles and techniques of handling fisheries resources in freshwater environments. Fall. Alternate even years. Mr. Werner.

Prerequisites: F Zool 525 and F Zool 516, or permission of instructor.

552. WILDLIFE ECOLOGY

3 credit hours

Two hours of lecture, three hours of laboratory. A study of the principles governing forest and range wildlife and of the biological mechanisms involved. Spring. Mr. Chambers.

Prerequisite: F Biol 320, or permission of instructor.

555. WILDLIFE METHODS

3 credit hours

Two hour lecture, three hour laboratory. Field and laboratory techniques, with emphasis on demonstration and experience. One weekend and Saturday field trips are scheduled. Fall. Mr. Chambers.

Prerequisite: F Zool 552.

570. PRINCIPLES OF ANIMAL BEHAVIOR

3 credit hours

Three hours of lecture per week. A study of the basic principles of animal behavior, stressing exogenous and endogenous mechanisms of control. Fall. Mr. Price.

Prerequisite: General Zoology.

575. BEHAVIORAL ECOLOGY

2 credit hours

Cranberry Lake Biological Station. Session I. Half time for four weeks. Study of the behavioral adaptations of animals to their environment. Emphasis will be placed on animal orientation and social behavior. Habitat selection and interspecific interactions will also be considered. Mr. Price, College of ES and F.

Prerequisites: General biology and general ecology.

Note: Credit may not be received for both F Zool 575 and F Zool 570.

580. HISTOLOGY

3 credit hours

Two hours of lecture; three hours laboratory. A study of mammalian tissues in the healthy and diseased states. Covers all tissues of the body: cartilaginous, bony, cardiovascular, lymphoid, integumentary, digestive, respiratory, urinary, endocrine, reproductive, and nervous. The laboratory deals with the preparation and examination of various kinds of tissues. Fall. Mr. Hartenstein.

Prerequisite: F Zool 100 or equivalent.

585. VERTEBRATE ANATOMY

4 credit hours

Three hours of lecture and recitation, three hours of laboratory. Comparative study of the anatomy of representative vertebrates, emphasizing structural, functional, and developmental characteristics. Fall. Mr. Graves.

620. INVERTEBRATE SYMBIOSIS

3 credit hours

Two hours of lecture and one three-hour laboratory. An introduction to the ecology and evolution of interspecific relationships of invertebrates. Spring, even years. Mr. Dindal.

Prerequisites: F Biol 320, F Zool 511.

630. COMPARATIVE ENDOCRINOLOGY

3 credit hours

Three hours lecture. General endocrinology with emphasis on the comparative functions of endocrine glands of animals. Spring. Mr. Graves.

Prerequisite: F Zool 530 or equivalent.

670. VERTEBRATE BEHAVIOR

3 credit hours

Two hours lecture, three hours laboratory. In-depth study of the major concepts of animal behavior associated with behavioral genetics, development, orientation, and social behavior. Spring. Mr. Price.

Prerequisite: F Zool 570.

700. FOREST ZOOLOGY TRIP

2 credit hours

A 7 to 10 day trip to (1) agencies engaged in zoological research, management, and administration, or (2) regions

or areas of unusual biological interest. A final report is required. Estimated student expense, \$75.00. Fall or Spring. Staff.

**720. TOPICS IN SOIL
INVERTEBRATE ECOLOGY**

3 credit hours

Two one-hour lecture-discussion periods and a three-hour laboratory. Study of literature relating to soil invertebrate microcommunities; taxonomy, culturing, and collection methods of soil fauna; student will conduct an individual research problem. Spring. Odd years. Mr. Dindal.

Prerequisite: Permission of instructor.

725. ZOOGEOGRAPHY

3 credit hours

Two hours of lecture, three hours of laboratory. Geographic distribution of vertebrate animals, factors determining their distribution, and nature of range occupied. Fall. Alternate odd years. Mr. Webb.

**750. ADVANCED WILDLIFE
MANAGEMENT**

3 credit hours

Two hours lecture, three hours laboratory. Advanced wildlife management with emphasis on regional and administrative wildlife problems. Extended trips (two weekend trips) are required. Spring. Mr. Chambers.

Prerequisite: F Zool 550 or permission of the instructor.

797. FOREST ZOOLOGY SEMINAR

1 credit hour

Two hours of discussion and assigned reports on current problems and new developments in forest zoology. Fall and/or Spring. Staff.

**798. PROBLEMS IN FOREST
ZOOLOGY**

Credit hours to be arranged

Hours to be arranged. Individual study of special problems in forest zoology. One typewritten report (original and one carbon) required. Fall and/or Spring. Staff.

830. PHYSIOLOGICAL ECOLOGY

3 credit hours

Two hours lecture, one hour discussion. An examination of the concepts of animal adaptation to ecological change from a physiological point of view. Particular emphasis will be placed on physiological responses of the vertebrate digestive, excretory, endocrine, nervous, and reproductive systems to modifications of the environment. Spring, odd numbered years. Mr. Graves.

Prerequisite: F Zool 630.

835. INVERTEBRATE PHYSIOLOGY

3 credit hours

Two hours lecture, three hours laboratory. A study of the physiologic mechanisms employed by invertebrates other than insects in coping with the exigencies of their environment. Fall or Spring. Alternate years. Mr. Hartenstein.

Prerequisites: F Zool 511 and F Zool 530.

899. MASTER'S THESIS

Credit hours to be arranged

Research and independent study for the Master's degree and thesis. Fall and Spring. Staff.

**950. TOPICS IN WILDLIFE
BIOLOGY**

1-3 credit hours

Hours to be arranged. Group study of a wildlife management topic. Fall or Spring. Mr. Chambers.

Prerequisite: Six credits of wildlife management courses.

**970. TOPICS IN ANIMAL
BEHAVIOR**

2 credit hours

Two hours lecture and discussion. A seminar-type course designed to explore in depth selected and controversial subject areas in animal behavior. Fall or Spring. Mr. Price.

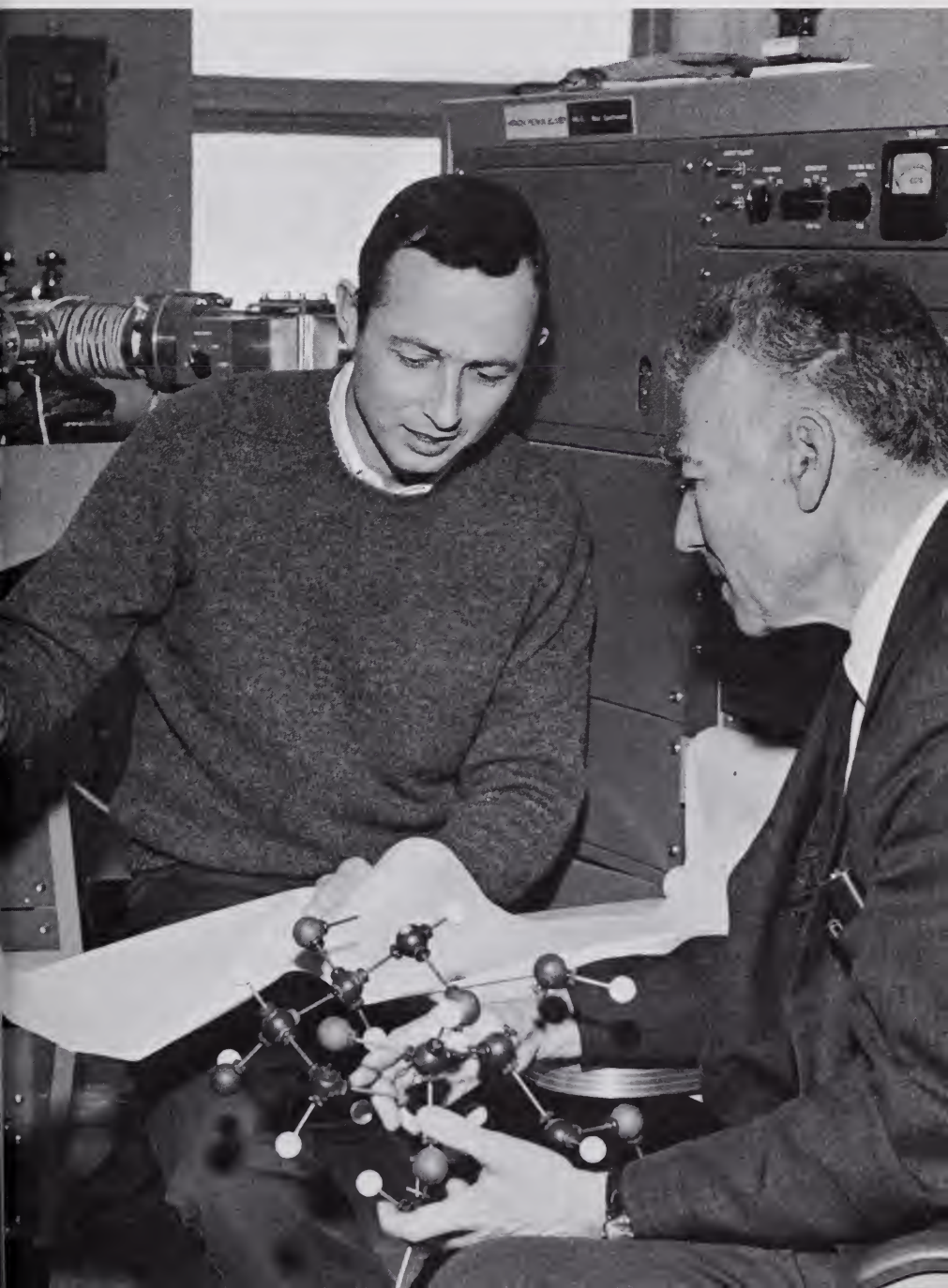
Prerequisite: F Zool 670 or equivalent.

999. DOCTORAL THESIS

Credit hours to be arranged

Research and independent study for the Doctoral degree and dissertation. Fall and Spring. Staff.

THE COLLEGE FACULTY
AND PROFESSIONAL STAFF



THE COLLEGE FACULTY AND PROFESSIONAL STAFF

The date in parentheses after each name denotes the first year of service, two or more dates, the term of service. An asterisk (*) indicates graduate faculty.

- MAURICE M. ALEXANDER (1949)*, *Professor and Chairman*, Department of Forest Zoology; B.S., State University of New York College of Forestry, 1940; M.S., University of Connecticut, 1942; Ph.D., State University of New York College of Forestry, 1950
- DOUGLAS C. ALLEN (1968)*, *Associate Professor*, Department of Forest Entomology; B.S., University of Maine, 1962; M.S., 1965; Ph.D., University of Michigan, 1968
- IRA H. AMES (1972), *Adjunct Assistant Professor*, Department of Forest Botany; B.A., Brooklyn College, 1959; M.S., New York University, 1962; Ph.D., 1966
- DAVID G. ANDERSON (1959), *Vice President for Administration, Associate Professor*; State University of New York College of Forestry (Ranger School), 1950; B.S., State University of New York College of Forestry, 1953; M.S., University of Utah, 1958
- ERIC A. ANDERSON (1950)*, *Professor*, Department of Wood Products Engineering; B.S.F., University of Washington, 1932; Ph.D., State University of New York College of Forestry, 1949
- ROBERT E. ANTHONY (1953), *Technical Specialist*, Department of Forest Botany; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1952
- GEORGE R. ARMSTRONG (1950)*, *Professor and Chairman*, Department of Managerial and Social Sciences; B.S., State University of New York College of Forestry, 1949; M.S., 1959; Ph.D., 1965
- ALAN L. AUGUST (1969), *Assistant to the Dean of Graduate Studies*, Graduate Office; B.A., American University, 1964; M.A., Syracuse University, 1968
- JAMES P. BAMBACHT (1967), *Assistant Professor*, Department of Paper Science and Engineering; A.B., Kalamazoo College, 1954; M.S., The Institute of Paper Chemistry, 1956
- C. ELLISON BECK (1970), *Technical Specialist*, Analytical and Technical Services, Central Program Services
- DONALD F. BEHREND (1960-67) (1968)*, *Acting Dean of Graduate Studies and Director of the Adirondack Ecological Center, Senior Research Associate*; B.S., University of Connecticut, 1958; M.S., 1960; Ph.D., State University of New York College of Forestry, 1966

- LEE U. BENDER (1970)*, *Associate Professor*, Department of Forest Engineering; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1959; M.S., 1960; Ph.D., Ohio State University, 1971
- JOHN D. BENNETT (1960)*, *Associate Professor*, Department of Managerial and Social Sciences; B.A., Ohio Wesleyan University, 1954; Ph.D., Syracuse University, 1968
- JOHN V. BERGLUND (1965)*, *Associate Professor*, Department of Silviculture and Forest Influences; B.S., Pennsylvania State University, 1962; M.S., 1964; Ph.D., State University of New York College of Forestry, 1968
- WILLIAM H. BETTINGER (1972), *Technical Specialist*, Analytical and Technical Services, Central Program Services
- DONALD H. BICKELHAUPT (1969), *Technical Assistant*, Department of Silviculture and Forest Influences; B.S., State University of New York College of Forestry, 1969
- ALFRED H. BISHOP (1942), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Professor*; State University of New York College of Forestry (Ranger School), 1925; B.S., State University of New York College of Forestry, 1929; M.F., 1931
- PETER E. BLACK (1965)*, *Associate Professor*, Department of Silviculture and Forest Influences; B.S., University of Michigan, 1956; M.F., 1958; Ph.D., Colorado State University, 1961
- ROBERT R. BOLTON (1972), *Instructor*, Department of Forest Engineering; B.A., LeMoyne College, 1959; M.S., Syracuse University, 1965
- WILLIAM R. BORGSTEDE (1971), *Technical Assistant*, Department of Forest Zoology; A.A.S., Miner Institute, 1966; A.A.S., State University of New York College at Delhi, 1970
- JEROME BREZNER (1961)*, *Professor*, Department of Forest Entomology; A.B., University of Rochester, 1952; A.M., University of Missouri, 1956; Ph.D., 1959
- ROBERT H. BROCK, JR. (1967)*, *Professor*, Department of Forest Engineering; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Cornell University, 1971
- RANIER H. BROCKE (1969)*, *Research Associate*, Department of Forest Zoology; B.S., Michigan State University, 1955; M.S., 1957; Ph.D., 1970
- KENNETH F. BURNS (1970), *Technical Assistant*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1969
- HARRY W. BURRY (1962), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., State University of New York College of Forestry, 1941; M.F., 1964
- PAUL M. CALUWE (1969)*, *Research Associate*, Department of Chemistry; M.S., University of Louvain, 1964; Ph.D., 1967

- ROBERT CAMPBELL (1972), *Adjunct Associate Professor*, School of Biology, Chemistry and Ecology; B.S., State University College of Forestry, 1953; M.F., University of Michigan, 1959; Ph.D., 1961
- HUGH O. CANHAM (1966)*, *Assistant Professor*, Department of Managerial and Social Sciences; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ph.D., 1971
- DIANNE M. CAPRITTA (1967), *Associate Librarian*, Moon Memorial Library; B.S., University of Illinois, 1965; M.S.L.S., Syracuse University, 1967
- LINDA J. CARMAN (1967), *Technical Assistant*, Analytical and Technical Services, Central Program Services
- RHONDDA K. CASSETTA (1967), *Associate for Institutional Research*, Office of the Vice President for Administration; A.B., Elmira College, 1933
- DANIEL M. CASTAGNOZZI (1956), *Professor and Director*, Ranger School, State University of New York College of Forestry (Ranger School), 1950; B.S.F., University of Michigan, 1952; M.F., State University of New York College of Forestry, 1957
- THOMAS CERNY (1970), *Assistant Director of Admissions*, Office of the Vice President for Student Affairs; B.S., Springfield College, 1965; M.Ed., 1966
- ROBERT E. CHAMBERS (1967)*, *Associate Professor*, Department of Forest Zoology; B.S., Pennsylvania State University, 1954; M.S., 1956; Ph.D., Ohio State University, 1972
- ANTHONY W. CHELZ (1970), *Instructor*, School of Landscape Architecture; B.A.E., School of the Art Institute, 1966; M.F.A., Syracuse University, 1970
- NEILS B. CHRISTIANSEN (1960)*, *Associate Professor*, Department of Managerial and Social Sciences; B.S., University of Idaho, 1957; M.S., State University of New York College of Forestry, 1959; Ph.D., 1966
- C. PETER CLUTE (1969), *Assistant to the President*, Office of the President; B.A., University of Toronto, 1965
- ROLLA W. COCHRAN (1964), *Assistant to the President*, Office of the President, *Associate Professor*; B.A., Denison University, 1949; M.S., Ohio State University, 1951
- JACK B. CODY (1968), *Senior Research Associate*, Applied Forestry Research Institute; B.S., University of Michigan, 1954; M.F., 1963
- HARRY J. CORR (1967), *Director of Business Affairs*, Office of the Vice President for Administration; B.S., Siena College, 1957
- WILFRED A. CÔTÉ, JR. (1950)*, *Professor*, Department of Wood Products Engineering, Director, Nelson Cortlandt Brown Laboratory for Ultrastructure Studies, Central Program Services; B.S., University of Maine, 1949; M.F., Duke University, 1950; Ph.D., State University of New York College of Forestry, 1958

- JAMES E. COUFAL (1965), *Associate Professor*, Ranger School; State University of New York College of Forestry (Ranger School), 1957; B.S., State University of New York College of Forestry, 1960; M.S., 1962
- PHILLIP J. CRAUL (1968)*, *Associate Professor*, Department of Silviculture and Forest Influences; B.S.F., Pennsylvania State University, 1954; M.S., 1960; Ph.D., 1964
- JAMES O. CREVELLING (1970), *Technical Assistant*, Southeast Water Supply Study Commission; A.A.S., Paul Smith's College, 1965; B.S., University of Massachusetts, 1967
- ZOLTAN CSUROS (1972), *Technical Assistant*, Polymer Research Center; B.S., Institute of Organic Chemistry, 1964; M.S., 1964; Ph.D., 1970
- TIBERIUS CUNIA (1968)*, *Professor*, Section of Biometry and Operations Research, School of Environmental and Resource Management; Forest Engineer, Ecole Nat. des Eaux et Forets, 1951; M.S., McGill University, 1957
- GEORGE W. CURRY (1966)*, *Associate Professor*, School of Landscape Architecture; B.A., Michigan State University, 1962; B.S., 1965; M.L.A., University of Illinois, 1969
- ROBERT W. DAVIDSON (1957)*, *Professor and Chairman*, Department of Wood Products Engineering; B.S., Montana State University, 1948; M.S., State University of New York College of Forestry, 1956; Ph.D., 1960
- ARNOLD C. DAY (1969), *Technical Specialist*, Nelson Cortlandt Brown Laboratory for Ultrastructure Studies, Central Program Services
- RUSSELL C. DECKERT (1952), *Associate Public Service Officer*, Office of Public Service and Continuing Education, *Professor*; B.S.F., University of Georgia, 1938; M.F., Duke University, 1943
- CARLTON W. DENCE (1951)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; B.S., Syracuse University, 1947; M.S., State University of New York College of Forestry, 1949; Ph.D., 1959
- CARL H. DE ZEEUW (1946)*, *Professor*, Department of Wood Products Engineering; A.B., Michigan State College, 1934; B.S., 1937; M.S., State University of New York College of Forestry, 1939; Ph.D., 1949
- DANIEL L. DINDAL (1966)*, *Associate Professor*, Department of Forest Zoology; B.S., Ohio State University, 1958; M.A., 1961; Ph.D., 1966
- JOANN L. DIONNE (1972), *Associate Librarian*, Moon Memorial Library; B.A., University of Michigan, 1963; A.M.L.S., 1965
- WILLIAM A. DUERR (1952)*, *Adjunct Professor*, School of Environmental and Resource Management; B.S., Iowa State College, 1934; M.S., University of Minnesota, 1939; A.M., Harvard University, 1941; Ph.D., 1944
- GEORGE F. EARLE (1952)*, *Professor*, School of Landscape Architecture; B.F.A., Syracuse University, 1937; M.F.A., Yale University, 1946

- HERBERT E. ECHELBERGER (1966), U.S. Forest Service Cooperative Recreation and Related Environmental Studies Research Unit, *Adjunct Assistant Professor*; B.S., Southern Illinois University, 1965; M.S., 1966
- ANDREW L. EGGERS (1967), *Media Engineer*; Office of Public Service and Continuing Education
- JOHN H. ENGELKEN (1959), *Assistant Professor, Forest Manager*, Heiberg Forest, Tully Campus; B.S.F., Utah State University, 1950
- ARTHUR R. ESCHNER (1961)*, *Professor*, Department of Silviculture and Forest Influences; B.S., State University of New York College of Forestry, 1950; M.S., Iowa State College, 1952; Ph.D., State University of New York College of Forestry, 1965
- ALAN D. FINNEGAN (1968), *Director of Student Counseling*, Office of the Vice President for Student Affairs; B.S., St. Lawrence University, 1955; M.Ed., 1959
- JEAN E. FISHER (1963), *Senior Research Associate*, Applied Forestry Research Institute, *Professor*; B.S., University of Idaho, 1941
- JOHN S. FISHLOCK (1965), *Technical Assistant*, Department of Forest Botany; State University of New York College of Forestry (Ranger School), 1965
- CLAUDE C. FREEMAN (1959), *Assistant Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1959
- ROBERT L. FRIEDMAN (1967), *Director of Admissions*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952; M.A., 1954
- RONALD B. FRODELIUS (1970), *Technical Assistant*, Department of Forest Engineering; B.L.A., State University of New York College of Forestry, 1963
- WILLIAM J. GABRIEL (1968), *Senior Research Associate*, Applied Forestry Research Institute; B.S., Michigan State University, 1964
- GERALD M. GARTHE (1967), *Research Associate*, Department of Managerial and Social Sciences; B.S., University of Idaho, 1961; M.F., North Carolina State University, 1965; Ph.D., State University of New York College of Environmental Science and Forestry, 1972
- JAMES W. GEIS (1968)*, *Assistant Professor*, Department of Forest Botany and Pathology; B.S.F., University of Illinois, 1965; M.S., 1967; Ph.D., State University of New York College of Environmental Science and Forestry, 1972
- RUSSELL E. GETTY (1966)*, *Professor and Chairman*, Department of Policy and Program Affairs; B.S., Iowa State College, 1936; M.S., 1951
- SERGE N. GORBATSEVICH (1956)*, *Associate Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1954; M.S., 1955

- PAUL F. GRAVES (1947)*, *Professor*, Department of Policy and Program Affairs; B.S., State University of New York College of Forestry, 1939; M.F., 1941; Ph.D., Syracuse University, 1950
- WILLIAM E. GRAVES (1967)*, *Associate Professor*, Department of Forest Zoology; B.S., University of Massachusetts, 1963; M.S., University of Wisconsin, 1965; Ph.D., 1967
- DONALD F. GREEN (1965), *Registrar*, Office of the Vice President for Student Affairs, *Associate Professor*; A.B., New York State College for Teachers, Albany, 1942; M.S., 1950
- MARY L. GREEN (1967), *Technical Assistant*, Analytical and Technical Services, Central Program Services; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1967
- DAVID H. GRIFFIN (1968)*, *Associate Professor*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1959; M.A., University of California, 1960; Ph.D., 1963
- DAVID G. GRIMBLE (1968), *Senior Research Associate*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1961; B.S., Michigan Technical University, 1964; M.F., University of Michigan, 1966
- AUSTIN F. HAMER (1968), *Coordinator of Continuing Education*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., Oregon State University, 1942; M.S., University of Oregon, 1962
- DAVID L. HANSELMAN (1963)*, *Coordinator of Educational Communications*, Office of Public Service and Continuing Education, *Associate Professor*; B.S., Cornell University, 1957; M.S., 1958; Ph.D., Ohio State University, 1963
- DAVID B. HARPER (1972), *Research Associate*, School of Landscape Architecture; B.S., Bates College, 1959; M.R.P., University of Pennsylvania, 1969
- ROY C. HARTENSTEIN (1959–1965) (1967)*, *Professor*, Department of Forest Zoology; B.S., State Teachers College at Buffalo, 1953; M.S., Syracuse University, 1957; Ph.D., State University of New York College of Forestry, 1959
- DAVID R. HAYNER (1968) (1971), *Administrative Assistant*, Ranger School; State University of New York College of Forestry (Ranger School), 1968; B.S., State University of New York College of Forestry, 1971
- ROBERT D. HENNIGAN (1967)*, *Professor*, Department of Policy and Program Affairs; B.C.E., Manhattan College, 1949; M.A., Syracuse University, 1964
- LEE P. HERRINGTON (1965)*, *Associate Professor*, Department of Silviculture and Forest Influences; B.S., University of Maine, 1959; M.F., Yale University, 1960; Ph.D., 1964
- BERNARD T. HOLTMAN (1968), *TV/Motion Picture Producer-Director*, Office of Public Service and Continuing Education; B.A., Siena College, 1950; M.S., Syracuse University, 1972

- ALLEN F. HORN, JR. (1957)*, *Professor*, Department of Policy and Program Affairs; B.S., Michigan State University, 1950; M.S., 1951; Ph.D., State University of New York College of Forestry, 1957; L.L.B., Syracuse University, 1967
- PAUL R. HUGHES (1946), *Technical Assistant*, Department of Paper Science and Engineering
- ROBERT V. JELINEK (1972)*, *Professor and Dean*, School of Environmental and Resource Engineering; B.S., Columbia University, 1945; M.S., 1947; Ph.D., 1953
- HAZEL S. JENNISON (1965), *Research Assistant*, Analytical and Technical Services, Central Program Services; B.S., Western Kentucky State College, 1941; M.S., Syracuse University, 1966
- JOHN W. JOHNSON (1970)*, *Professor and Chairman*, Department of Silviculture and Forest Influences; B.S., University of Michigan, 1946; Ph.D., North Carolina State University, 1972
- RONALD R. KARNS (1965), *Editor*, Office of Public Service and Continuing Education; B.S., Ohio State University, 1954
- JOSEPH D. KASILE (1965), *Professor*, Section of Biometry and Operations Research, School of Environmental and Resource Management; B.S., Iowa State University, 1959; M.S., Oregon State University, 1960; Ph.D., North Carolina State University, 1972
- EDWIN H. KETCHLEDGE (1955)*, *Professor*, Department of Forest Botany and Pathology, *Associate Director*, Cranberry Lake Biological Station, Cranberry Lake Campus, *Forest Manager*, Pack Demonstration Forest, Cranberry Lake, Cranberry Lake Campus; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., Stanford University, 1957
- DANIEL J. KLEMMANN (1970), *Technical Assistant*, Ranger School; State University of New York College of Forestry (Ranger School), 1966
- THEODORE J. KOCHANNEK (1936), *Director of Physical Plant*; Office of the Vice President for Administration
- DONALD E. KOTEN (1961)*, *Associate Professor*, Department of Managerial and Social Sciences; B.A., North Central College, 1951; B.S., Oregon State College, 1957; Ph.D., State University of New York College of Forestry, 1966
- STELLA KROFT (1973), *Technical Assistant*, Office of Public Service and Continuing Education
- MARTIN KRONMAN (1970), *Adjunct Professor*, Department of Forest Chemistry; B.S., Rutgers University, 1950; Ph.D., Temple University, 1955
- FRANK E. KURCZEWSKI (1966)*, *Associate Professor*, Department of Forest Entomology; B.S., Allegheny College, 1958; M.S., Cornell University, 1962; Ph.D., 1964
- GEORGE H. KYANKA (1967), *Associate Professor*, Department of Wood Products Engineering; B.S., Syracuse University, 1962; M.S., 1966

- CHARLES N. LAFORTY (1965), *Assistant Facilities Program Coordinator*, Office of the Vice President for Administration
- ROBERT T. LALONDE (1959)*, *Professor*, Department of Chemistry; B.A., St. John's University, 1953; Ph.D., University of Colorado, 1957
- RICHARD W. LALOR (1953), *Associate Professor of English*; B.S., New York State College for Teachers, Albany, 1941; A.M., Cornell University, 1946
- GERALD N. LANIER (1970)*, *Assistant Professor*, Department of Forest Entomology; B.S., University of California, 1960; M.S., 1965; Ph.D., 1967
- RONALD F. LAPLAINE (1953), *Research Assistant*, Department of Paper Science and Engineering
- CHARLES C. LARSON (1950)*, *Professor and Dean*, School of Environmental and Resource Management; A.S., North Dakota State School of Forestry, 1938; B.S., University of Minnesota, 1940; M.S., University of Vermont, 1943; Ph.D., State University of New York College of Forestry, 1952
- RICHARD V. LEA (1946-56) (1967)*, *Associate Professor*, Department of Silviculture and Forest Influences; *Director*, Summer Field Session, Warrensburg Campus; B.S., State University of New York College of Forestry, 1946; M.S., 1948; Ph.D., 1953
- ALBERT L. LEAF (1957)*, *Professor*, Department of Silviculture and Forest Influences; B.S.F., University of Washington, 1950; M.F., 1952; Ph.D., University of Wisconsin, 1957
- CHARLES N. LEE (1959)*, *Director*, Computer Center, *Professor*, Department of Forest Engineering; B.S., State University of New York College of Forestry, 1949; B.C.E., Syracuse University, 1957; M.C.E., 1959
- RAYMOND E. LEONARD (1964)*, U.S. Forest Service Cooperative Watershed and Related Environmental Studies Research Unit, *Adjunct Professor*; B.S., University of Vermont, 1955; M.M.M., University of Helsinki, 1957; M.F., Yale University, 1964; Ph.D., State University of New York College of Forestry, 1967
- BENGT LEOPOLD (1961)*, *Director*, Empire State Paper Research Institute, *Professor*; B.Sc., Royal Institute of Technology, Stockholm, 1947; Licentiat, 1949; Ph.D., 1952
- GIDEON LEVIN (1972), *Research Associate*, State University Polymer Research Center; B.S., Technion, Israel Institute of Technology, 1960; M.S., Purdue University, 1965; Ph.D., State University of New York College of Forestry, 1971
- ALLEN R. LEWIS (1970)*, *Assistant Professor*, School of Landscape Architecture; B.A., University of Oklahoma, 1959; M.C.P., University of California (Berkeley), 1961
- JOHN F. LITCHER (1970), *Director of Campus Security*, Office of the Vice President for Administration; A.A.S., Onondaga Community College, 1968

- JOSIAH L. LOWE (1933)*, *Professor*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1927; Ph.D., University of Michigan, 1938
- PHILIP LUNER (1957)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; B.Sc., University of Montreal (Loyola College), 1947; Ph.D., McGill University, 1951
- LYMAN W. LYON (1970), *Programmer Analyst*, Computer Center; B.A., Syracuse University, 1968
- J. DONALD MABIE (1967), *Assistant to the Vice President*, Office of the Vice President for Research; B.S., State University of New York at Albany, 1961
- CHRISTOPHER W. A. MACEY (1972), *Assistant Professor*, School of Landscape Architecture; B.L.A., State University of New York College of Forestry, 1965; M.L.A., 1971
- WALTER A. MAIER (1966), *Technical Specialist*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1960
- PAUL D. MANION (1967)*, *Associate Professor*, Department of Forest Botany and Pathology; B.S., University of Minnesota, 1962; M.S., 1965; Ph.D., 1967
- MARY ANNE T. MARANO (1972), *Bursar*, Business Office; A.A., Onondaga Community College, 1967
- FRANK L. MARAVIGLIA (1964), *Assistant Professor*, School of Landscape Architecture; B.S., State University of New York College of Education, Oswego, 1958; M.S., Hofstra University, 1963
- RICHARD E. MARK (1970)*, *Senior Research Associate*, Empire State Paper Research Institute, *Adjunct Associate Professor*; B.S., State University of New York College of Forestry, 1950; M.S., Yale University, 1960; Ph.D., 1965
- DANIEL L. MARLATT (1968), *Forester*, Huntington Forest, Newcomb Campus; A.A.S., Paul Smith's College, 1960; B.S., State University of New York College of Forestry, 1962
- RAYMOND L. MARLER (1970), *Director and Senior Research Associate*, Applied Forestry Research Institute; B.S., University of Michigan, 1948; M.F., 1948
- ALLEN D. MARSTERS (1966), *Technical Assistant*, Department of Forest Zoology; B.S., State University of New York College of Forestry, 1966
- CHARLES E. MARTIN II (1962), *Associate Professor*, Ranger School; B.S., Duke University, 1953; M.F., 1954
- RENATA MARTON (1957)*, *Senior Research Associate*, Empire State Paper Research Institute, *Professor*; Master Ph. (Chemistry), Jagiello University, 1934; Ph.D., 1936
- RAYMOND D. MASTERS (1968), *Technical Assistant*, Huntington Forest, Newcomb Campus; A.A.S., Paul Smith's College, 1967

- GEORGE F. MATTFELD (1965), *Research Assistant*, Huntington Forest, Newcomb Campus; B.S., State University of New York College of Forestry, 1962; M.S., University of Michigan, 1964
- LARRY L. McCANDLESS (1972), *Technical Specialist*, Analytical and Technical Services, Central Program Services
- MICHAEL C. McCLOSKEY (1969), *Personnel Associate*, Office of the Vice President for Administration; State University of New York College of Forestry (Ranger School), 1964; B.S., State University of New York College of Forestry, 1969
- LARRY L. McDOWELL (1964)*, *Research Associate*, Department of Forest Botany and Pathology; B.S., Utah State University, 1958; Ph.D., Oregon State University, 1964
- JOHN J. McKEON (1969), *Technical Specialist*, Nelson Cortlandt Brown Laboratory for Ultrastructure Studies, Central Program Services
- DONALD G. McLEAN (1968), *Programmer Analyst*, Computer Center
- ANDREW McVICKER (1946), *Technical Specialist*, Department of Paper Science and Engineering
- JOHN A. MEYER (1958)*, *Senior Research Associate and Professor; Director*, Analytical and Technical Services, Central Program Services; B.S., Pennsylvania State College, 1949; M.S., 1950; Ph.D., State University of New York College of Forestry, 1958
- HOWARD C. MILLER (1950), *Associate Public Service Officer*, Office of Public Service and Continuing Education; *Professor*; B.S., State University of New York College of Forestry, 1941; Ph.D., Cornell University, 1951
- RICHARD W. MILLER (1966), *Assistant Professor*, Ranger School; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1956
- LEON S. MINCKLER (1970)*, *Adjunct Professor*, School of Environmental and Resource Management; B.S., State University of New York College of Forestry, 1928; Ph.D., 1936
- GEORGE MOELLER (1968), *Project Director*, U.S. Forest Service Cooperative Recreation and Related Environmental Studies Research Unit, *Adjunct Associate Professor*; B.S., Southern Illinois University, 1963; M.S., 1965
- JAMES O. MOORE (1965), *Manager*, Computer Center; B.M.E., Rensselaer Polytechnic Institute, 1960
- RAYMOND A. MOORE (1954)*, *Assistant Professor*, Department of Wood Products Engineering; B.S.F., West Virginia University, 1951; M.S., North Carolina State College, 1952
- CHARLIE D. MORRIS (1972), *Adjunct Assistant Professor*, Department of Forest Entomology; B.S., Ohio University, 1963; M.S., University of Wisconsin, 1967; Ph.D., 1969

- DOUGLAS A. MORRISON (1969)*, *Research Associate*, Department of Managerial and Social Sciences; B.A., University of Western Ontario, 1966; M.S., University of Oregon, 1967; Ph.D., 1969
- EDWARD J. MULLIGAN (1968), *Technical Specialist*, Analytical and Technical Services, Central Program Services
- TSUTOMU NAKATSUGAWA (1968)*, *Associate Professor*, Department of Forest Entomology; B. Agric., Tokyo University, 1957; M.S., Iowa State University, 1961; Ph.D., 1964
- ROGER L. NISSEN, JR. (1971), *Technical Assistant*, Applied Forestry Research Institute; A.A.S., Paul Smith's College, 1970
- ROY A. NORTON (1970), *Technical Assistant*, Department of Forest Zoology; B.S., State University of New York College of Forestry, 1969
- JOHN D. NOVADO (1967), *Editorial Associate*, Office of Public Service and Continuing Education; B.A., Syracuse University, 1965
- RALPH D. NYLAND (1967), *Senior Research Associate*, Applied Forestry Research Institute; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Michigan State University, 1966
- ALFRED OBRIST (1970), *Professor (Part-time)*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1941
- FREDERICK W. O'NEIL (1937)*, *Professor and Chairman*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1933; M.S., 1935
- DONALD A. PAFKA (1967), *Technical Assistant*, Department of Silviculture and Forest Influences; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1956; State University of New York College of Forestry (Ranger School), 1966
- MARIA A. PAFUNDI (1973), *Technical Assistant*, Community Relations Office; B.A., The College of Saint Rose, 1970; M.A., Syracuse University, 1972
- DAVID G. PALMER (1966), *Associate Professor*, Department of Forest Engineering; B.S., General Motors Institute, 1962; M.S., Syracuse University, 1964
- EDWARD E. PALMER (1969), *President*; A.B., Middlebury College, 1939; Ph.D., Syracuse University, 1949
- HARRISON H. PAYNE (1964), *Vice President for Student Affairs, Professor*, Department of Forest Zoology; B.S., State University of New York College of Forestry, 1950; M.Ed., St. Lawrence University, 1955; Ed.D., Cornell University, 1963
- RICHARD E. PENTONEY (1953)*, *Vice President for Research, Professor*, Department of Wood Products Engineering; B.S., University of California, 1949; M.S., State University of New York College of Forestry, 1952; Ph.D., 1956

- JANIS PETRICEKS (1968)*, *Associate Professor*, Department of Managerial and Social Sciences; University of Frieburg, 1950; M. Agr., Interamerican Institute of Agricultural Sciences, 1956; Ph.D., State University of New York College of Forestry, 1968
- JACOBUS B. POOT (1968), *Technical Specialist*, Analytical and Technical Services, Central Program Services
- FREDERICK S. POTTER (1972), *Technical Assistant*, Department of Chemistry; B.S., Utica College, 1971
- SHELLEY W. POTTER, JR. (1956), *Manager, Pack Demonstration Forest*, Warrensburg Campus, *Assistant Professor*, State University of New York College of Forestry (Ranger School), 1947; B.S., University of Michigan, 1951
- EDWARD O. PRICE (1966)*, *Associate Professor*, Department of Forest Zoology; B.A., The College of Wooster, 1960; M.S., Michigan State University, 1963; Ph.D., 1966
- WILLEM PRINS (1970), *Adjunct Professor*, Department of Chemistry; Chem. Cand. University of Groningen, 1950; Ph.D., University of Leiden, 1955
- JUNE E. PUTT (1970), *Assistant Registrar*, Office of the Vice President for Student Affairs; B.A., University of Connecticut, 1967; M.A., Cornell University, 1969
- DAVID C. RANDALL (1972), *Assistant Professor*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1966; Ph.D., University of California-Davis, 1972
- THOMAS B. REAGAN (1971), *Television Engineer*; Office of Public Service and Continuing Education
- JOHN R. REEVES (1966), *Student Financial Aids Officer*, Office of the Vice President for Student Affairs; B.S., State University of New York at Cortland, 1960; M.S., Syracuse University, 1964
- ROBERT G. REIMANN (1962)*, *Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1954
- KERMIT E. REMELE (1962), *Associate Professor*, Ranger School; State University of New York College of Forestry (Ranger School), 1943; B.S., State University of New York College of Forestry, 1949; M.F., University of Michigan, 1952
- NORMAN A. RICHARDS (1963)*, *Associate Professor*, Department of Silviculture and Forest Influences; B.S., State University of New York College of Forestry, 1957; M.S., Cornell University, 1959; Ph.D., State University of New York College of Forestry, 1968
- KATHERINE P. ROSSI (1966), *Associate Librarian*, Moon Memorial Library; B.A., William Smith College, 1945; M.S.L.S., Syracuse University, 1966
- SAMUEL ROTHENBERG (1946), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1943; M.S., 1964

- FAY RUMSEY (1961), *Technical Assistant*, School of Environmental and Resource Management
- ANATOLE SARKO (1967)*, *Senior Research Associate*, Department of Chemistry, *Associate Professor*; B.S., Upsala College, 1952; M.S., New York University, 1961; Ph.D., State University of New York College of Forestry, 1966
- MICHAIL SCHAEDEL (1965)*, *Associate Professor*, Department of Forest Botany and Pathology; B.S., University of British Columbia, 1957; M.S., 1959; Ph.D., University of California, 1964
- CONRAD SCHUERCH (1949)*, *Professor*, Department of Chemistry; B.S., Massachusetts Institute of Technology, 1940; Ph.D., 1947
- BRADFORD G. SEARS (1941)*, *Professor and Dean*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1939; M.S., 1948
- ELWOOD L. SHAFER, JR. (1962)*, *Adjunct Professor*, United States Forest Service, *Director*, Pinchot Institute; B.S., Pennsylvania State University, 1956; M.F., 1957; Ph.D., State University of New York College of Forestry, 1966
- JOHN F. SIAU (1963-64) (1965) (1966)*, *Research Associate*, Department of Wood Products Engineering, *Associate Professor*; B.S., Michigan State University, 1943; M.S., State University of New York College of Forestry, 1965; Ph.D., 1968
- SAVEL B. SILVERBORG (1947)*, *Professor*, Department of Forest Botany and Pathology; B.S., University of Idaho, 1936; Ph.D., University of Minnesota, 1948
- ROBERT M. SILVERSTEIN (1969)*, *Professor*, Department of Chemistry; B.S., University of Pennsylvania, 1937; M.S., New York University, 1941; Ph.D., 1949
- JOHN B. SIMEONE (1948)*, *Professor and Chairman*, Department of Forest Entomology; B.S., Rhode Island State College, 1942; M.F., Yale University, 1948; Ph.D., Cornell University, 1960
- CHRISTEN SKAAR (1946-48) (1949)*, *Professor*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1943; M.S., 1948; Ph.D., Yale University, 1957
- JOHANNES SMID (1956-57) (1960)*, *Professor*, Department of Chemistry; B.Sc., Free University, 1952; M.Sc., 1954; Ph.D., State University of New York College of Forestry, 1957
- GERALD H. SMITH (1946)*, *Professor*, Department of Wood Products Engineering; Executive Chairman of the Faculty (1970-1972); B.S., State University of New York College of Forestry, 1937; M.B.A., Syracuse University, 1956
- KENNETH J. SMITH, JR. (1968)*, *Professor and Chairman*, Department of Chemistry; *Assistant Director*, State University Polymer Research Center; B.A., East Carolina College, 1957; M.A., Duke University, 1959; Ph.D., 1962

- LEONARD A. SMITH (1964), *Research Associate*, Department of Wood Products Engineering; B.S., Ch.E., University of Dayton, 1962; M.S., Ch.E., Case Institute of Technology, 1964; Ph.D., State University of New York College of Forestry, 1972
- ROBERT P. SMITH (1969), *Technical Assistant*, Department of Forest Entomology; B.S., State University of New York College of Forestry, 1970
- GEORGE A. SNYDER (1970), *College Photographer*; Office of Public Service and Continuing Education
- ERNEST SONDHEIMER (1957)*, *Professor*, Department of Chemistry; B.Sc., City College of New York, 1946; Ph.D., Cornell University, 1952
- THEODORE J. STENUF (1960)*, *Professor*, Department of Paper Science and Engineering; B.Ch.E., Syracuse University, 1949; M.Ch.E., 1951; Ph.D., 1953
- JOHN J. STERBENZ (1973), *Instructor*, Ranger School; State University College of Forestry (Ranger School), 1966; B.S., University of Michigan, 1970; M.S., 1972
- WILLIAM M. STITELER (1973), *Associate Professor*; Section of Biometry and Operations Research, School of Environmental and Resource Management; B.S., Pennsylvania State University, 1964; M.S., 1965; Ph.D., 1970
- ROGER W. STRAUSS (1955–60) (1966)*, *Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., 1961
- WILLIAM J. SULLIVAN (1966), *Instructor*, Department of Managerial and Social Sciences; B.S., Pennsylvania State University, 1960; M.S., State University of New York College of Forestry, 1971
- VIVIAN R. SUTTON (1962), *Associate Professor of English*; A.G., Oberlin College, 1934; M.A., Bryn Mawr, 1937; Ph.D., 1942
- MICHAEL M. SZWARC (1952)*, *Distinguished Professor*, Department of Chemistry, *Director*, State University Polymer Research Center; Ch.E., Polytechnika Warszawska, 1932; Ph.D., (Organic Chemistry) Hebrew University, Jerusalem, 1942; Ph.D., (Physical Chemistry) University of Manchester, 1947; D.Sc., 1949; F.R.S., (London), 1966
- DAVID W. TABER (1970), *Adjunct Extension Specialist*, Office of Public Service and Continuing Education; B.S., University of Maine, 1961; M.S., 1968
- STUART W. TANENBAUM (1973), *Professor and Dean*, School of Biology, Chemistry and Ecology; B.S., City College of New York, 1944; Ph.D., Columbia University, 1951
- HERBERT B. TEPPER (1962)*, *Professor and Chairman*, Department of Forest Botany and Pathology; B.S., State University of New York College of Forestry, 1953; M.S., 1958; Ph.D., University of California, 1962

- JAMES L. THORPE (1965), *Research Assistant*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1965
- WILLIAM C. TIERSON (1961)*, *Manager*, Huntington Forest, Newcomb Campus; B.S., State University of New York College of Forestry, 1949; M.F., 1967
- TOR E. TIMELL (1962)*, *Professor*, Department of Chemistry, *Director*, Cellulose Research Institute; Civiling, Royal Institute of Technology, Stockholm, 1946; Tekn. lic., 1948; Ph.D., 1950
- R. GARY TREGASKIS (1969), *Technical Specialist*, Office of Public Service and Continuing Education; A.A.S., Broome Technical Community College, 1967
- WALTER M. TRYON (1970), *Instructor*, School of Landscape Architecture; B.L.A., State University of New York College of Forestry, 1964
- WILLIAM P. TULLY (1966), *Associate Professor and Acting Chairman*, Department of Forest Engineering; B.S., Northeastern University, 1964; M.S., 1966
- FREDERICK A. VALENTINE (1956)*, *Professor*, Department of Forest Botany and Pathology; B.S., St. Cloud State Teachers College, 1949; M.S., University of Wisconsin, 1953; Ph.D., 1957
- LARRY W. VANDRUFF (1970), *Assistant Professor*, Department of Forest Zoology; B.S., Mansfield College, 1964; M.S., Cornell University, 1966; Ph.D., 1970
- DANIEL C. WALTON (1963)*, *Associate Professor*, Department of Chemistry; B.Ch.E., University of Delaware, 1955; Ph.D., State University of New York College of Forestry, 1962
- CHUN-JUAN WANG (1959)*, *Professor*, Department of Forest Botany and Pathology; B.S., Taiwan University, 1950; M.S., Vassar College, 1953; Ph.D., State University of Iowa, 1955
- WILLIAM L. WEBB (1937)*, *Professor*, Department of Forest Zoology; B.S., University of Minnesota, 1935; M.S., 1940; Ph.D., Syracuse University, 1950
- DONALD F. WEBSTER (1973), *Librarian*, Moon Memorial Library; B.A., Hofstra University, 1959; M.L.S., Queens College, 1965
- ROBERT G. WERNER (1966-69) (1970)*, *Associate Professor*, Department of Forest Zoology; B.S., Purdue University, 1958; M.A., University of California, 1963; Ph.D., Indiana University, 1966
- ROBERT D. WESTFALL (1972), *Research Associate*, Department of Silviculture and Forest Influences; B.S., Michigan State University, 1967; Ph.D., 1972
- LAWRENCE W. WHELPTON (1969), *Technical Specialist*, Department of Forest Botany; A.A.S., State University of New York Agricultural and Technical College at Alfred, 1965

- SIDNEY A. WHITT (1968)*, *Professor*, Department of Wood Products Engineering; B.S., University of Alabama, 1933; M.S., Massachusetts Institute of Technology, 1937; D. Engr. Sc., New York University, 1962
- HUGH E. WILCOX (1951)*, *Professor*, Department of Forest Botany and Pathology; B.S., University of California, 1938; M.S., State University of New York College of Forestry, 1940; Ph.D., University of California, 1950
- DAVID E. WILKINS (1966), *Technical Specialist*, Central Research Services
- ELLIS T. WILLIAMS (1966), *Adjunct Professor*, School of Environmental and Resource Management; B.A., Yale University, 1930; M.B.A., Harvard University, 1932
- PETER F. WILTSIE (1968), *Assistant Director of Business Affairs*, Business Office; A.B., Utica College of Syracuse University, 1965
- JOHN M. YAVORSKY (1948–56) (1967)*, *Dean of Public Service, Continuing Education and Educational Communications; Professor*; B.S., State University of New York College of Forestry, 1942; M.S., 1947; Ph.D., 1955
- ROBERT A. ZABEL (1947)*, *Vice President for Academic Affairs, Professor*, Department of Forest Botany and Pathology; B.S., University of Minnesota, 1938; M.S., State University of New York College of Forestry, 1941; Ph.D., 1948

EMERITUS

- GEORGE J. ALBRECHT (1946–1968), *Professor Emeritus, Director Emeritus*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1930
- LAWRENCE J. BELANGER (1947–1965), *Registrar Emeritus, Professor Emeritus*; B.S., Syracuse University, 1932; M.S., New York State College for Teachers, Albany, 1941
- HAROLD C. BELYEA (1917–1956), *Professor Emeritus*; B.A., University of Mount Allison, 1908; M.A., 1911; B.Sc.F., University of New Brunswick, 1911; M.F., Yale University, 1916
- C. ALLEN BICKFORD (1963–1972), *Professor Emeritus*; B.S., University of Idaho, 1925; M.S., Dartmouth University, 1931
- FLOYD E. CARLSON (1930–1969), *Professor Emeritus*; B.S.F., University of Washington, 1928; M.F., 1930
- RAYMOND F. CROSSMAN (1942–1968), *Dean of Students Emeritus, Professor Emeritus*; B.A., Syracuse University, 1926; M.A., 1931
- JAMES E. DAVIS (1947–1965), *Professor Emeritus*; B.S., Cornell University, 1924; M.F., 1926

- CARLYN C. DELAVAN (1923–1957), *Professor Emeritus*; A.B., University of Michigan, 1914; M.F.S., 1915
- WILFORD A. DENCE (1920–1961), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1920
- JAMES F. DUBUAR (1919–1957), *Director Emeritus, Ranger School, Professor Emeritus*; A.B., University of Michigan, 1913; M.S.F., 1915
- C. EUGENE FARNSWORTH (1930–1972), *Professor Emeritus*; B.S.F., Iowa State College, 1926; M.F., Yale University, 1928; Ph.D., University of Michigan, 1945
- CARL C. FORSAITH (1917–1959), *Professor Emeritus*; B.A., Dartmouth College, 1913; M.A., Harvard University, 1914; Ph.D., 1917
- CLIFFORD H. FOSTER (1927–1959), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1921; M.F., 1922; M.S., Harvard University, 1924
- PHILIP J. HADDOCK (1929–1970), *Assistant Professor Emeritus*; State University of New York College of Forestry (Ranger School), 1926
- GEORGE H. HAINES (1953–1968), *Director of Business Affairs Emeritus*; B.S., University of Rhode Island, 1932
- WILLIAM M. HARLOW (1928–1965), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1925; M.S., 1926; Ph.D., 1928
- RAY R. HIRT (1921–1959), *Senior Professor Emeritus*; B.S., Hamline University, 1917; M.S., State University of New York College of Forestry, 1924; Ph.D., 1928
- RAYMOND J. HOYLE (1918–1957), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1917; M.S., Syracuse University, 1930
- EDWIN C. JAHN (1938–1972), *Dean Emeritus, Professor Emeritus*; B.S., State University of New York College of Forestry, 1925; M.S., 1926; Ph.D., McGill University, 1929
- RALPH T. KING (1937–1965), *Professor Emeritus*; B.S., Utah State Agricultural College, 1924; M.S., 1925
- ORRIN L. LATHAM (1930–1966), *Associate Professor Emeritus*; B.S.F., Iowa State College, 1927; M.F., Yale University, 1932
- AUBREY H. MACANDREWS (1926–1962), *Professor Emeritus*; Truro Agriculture College, 1922; B.S., State University of New York College of Forestry, 1925; M.S., 1926
- HENRY F. A. MEIER (1912–1914 (1929–1946), *Professor Emeritus*; B.A., Indiana University, 1912; M.A., 1913; Ph.D., Columbia University, 1920
- JOHN L. MORRISON (1946–1971), *Professor Emeritus*; A.B., University of Nebraska, 1933; A.M., 1935; Ph.D., University of California, 1941

- LUCIAN P. PLUMLEY (1936–1967), *Director Emeritus, Ranger School, Professor Emeritus*; State University of New York College of Forestry (Ranger School), 1931; B.S., State University of New York College of Forestry, 1935
- JOHN C. SAMMI (1929–1967), *Professor Emeritus*; B.S., University of California, 1922; M.F., State University of New York College of Forestry, 1931
- HARDY L. SHIRLEY (1945–1967), *Dean Emeritus, Professor Emeritus*; B.A., Indiana University, 1922; Ph.D., Yale University, 1928; D.h.c., University of Helsinki, 1958; D.Sc., Syracuse University, 1966
- BRUCE T. STANTON (1946–1972), *Professor Emeritus*; State University of New York College of Forestry (Ranger School), 1927; B.S., State University of New York College of Forestry, 1940; M.F., 1942
- LEROY C. STEGEMAN (1929–1965), *Professor Emeritus*; B.S., Michigan State College, 1928; M.S., University of Michigan, 1929
- RALPH G. UNGER (1937–1964), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1930
- FAY WELCH (1932–1967), *Lecturer Emeritus*; B.S., State University of New York College of Forestry, 1922
- WALTER L. WELCH (1950–1965), *Associate Professor Emeritus*; A.B., Syracuse University, 1946
- HAROLD G. WILM (1953–1966), *Professor Emeritus, Associate Dean Emeritus*; B.S., Colorado College, 1929; M.F., Cornell University, 1930; Ph.D., 1932
- LOUIS E. WISE (1919–1932), *Professor Emeritus*; B.A., Columbia University, 1907; Ph.D., 1911

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